– Final –

Environmental Assessment

for the

Advanced Extremely High Frequency Satellite Beddown and Deployment Program

Prepared for: **Military Satellite Communications Systems Wing**
Space and Missile Systems Center
Los Angeles Air Force Base, California

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14. ABSTRACT

This Environmental Assessment (EA) documents the potential environmental impacts of conducting beddown, deployment, processing, pre-launch preparations, launch, operations, and disposal for up to six Advanced Extremely High Frequency (AEHF) satellites at Cape Canaveral Air Force Station in Florida. The satellites would be launched from an existing Space Launch Complex using Evolved Expendable Launch Vehicles, which were analyzed in prior environmental documents separate from this EA.

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FINDING OF NO SIGNIFICANT IMPACT
ENVIRONMENTAL ASSESSMENT FOR THE
ADVANCED EXTREMELY HIGH FREQUENCY SATELLITE
BEDDOWN AND DEPLOYMENT PROGRAM

AGENCY: United States Air Force (USAF)

BACKGROUND: The USAF prepared an Environmental Assessment (EA) to evaluate the potential environmental consequences of beddown and deployment activities associated with Advanced Extremely High Frequency (AEHF) satellites at Cape Canaveral Air Force Station (CCAFS) in Florida. The attached EA, which is hereby incorporated by reference, was prepared in accordance with the National Environmental Policy Act (NEPA); Executive Order 12114 (*Environmental Effects Abroad of Major Federal Actions*); Council on Environmental Quality (CEQ) Regulations (40 Code of Federal Regulations [CFR] Parts 1500-1508); and 32 CFR Part 989 (*Environmental Impact Analysis Process*).

The AEHF satellite system is the follow-on to the USAF's current Milstar communications satellite constellation. The AEHF system augments and improves on the capabilities of Milstar, and expands the Department of Defense's Military Satellite Communication architecture. The AEHF would provide connectivity across the spectrum of mission areas, including: land, air, and naval warfare; special operations; strategic nuclear operations; strategic defense; theater missile defense; and space operations and intelligence.

DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES: The Proposed Action is to conduct beddown, deployment, processing, pre-launch preparations, launch, operations, and disposal for up to six AEHF satellites at CCAFS. To conduct these operations, existing buildings and facilities—located at CCAFS, John F. Kennedy Space Center (KSC), and at off-base contractor sites—would be used. The satellites would be launched from an existing Space Launch Complex using Evolved Expendable Launch Vehicles (EELVs). The satellite launches would occur over an 11-year period between Fiscal Years 2010 and 2020.

The environmental impacts resulting from EELV launch activities for various payloads were previously analyzed in the USAF's *Final Environmental Impact Statement (EIS)—Evolved Expendable Launch Vehicle Program* (1998) and *Final Supplemental EIS for the Evolved Expendable Launch Vehicle Program* (2000). Because the EELV launches planned for the upcoming AEHF satellites would not substantially alter the impact findings described in the EISs, the AEHF EA assesses the effects of conducting such launch activities by incorporating the EISs by reference. With regards to post-launch environmental impacts, however, the EA includes analysis of AEHF satellite end-of-life and disposal operations.

ENVIRONMENTAL EFFECTS: The USAF assessed potential impacts of the Proposed Action at CCAFS and in the vicinity of CCAFS. For this location, the following resources could be affected and were analyzed in the document: air quality, noise, water resources, biological resources, safety and occupational health, and hazardous materials and waste management. Within the Global Environment, potential impacts on the global atmosphere and from re-entry debris were also assessed. Other resource topics were not analyzed in the EA because there would be little or no measurable effects on them. Those resources not analyzed are: airspace, cultural resources, soils and geology, land use, socioeconomics and environmental justice, and transportation and infrastructure. A summary of the analysis results is provided below.

Cape Canaveral Air Force Station and Vicinity

The proposed activities would temporarily increase air emissions, but would not exceed Federal and state *de minimis* (minimal importance) thresholds for criteria pollutants, would not be regionally significant or contribute to a violation of CCAFS's or KSC's air operating permits, and would conform completely to the Florida State Implementation Plan. Temporary increases in noise would occur primarily from up to two C-5 aircraft operations (landings and takeoffs) per year. Noise levels, however, would not exceed ambient noise level standards as determined by the Federal, state, and/or local government. The Proposed Action would utilize existing facilities, would not involve any disturbance of vegetative habitats or off-road travel, and would comply with existing wildlife management plans. Thus, the proposed activities are expected to have "no effect" on state and Federally listed species.

Because of the precautions taken by the USAF and their contractors to prevent accidental spills and leakage of liquid propellants, the risk of water contamination is low. If a hazardous material incident were to occur, appropriate emergency response resources are available within each affected jurisdiction to isolate, contain, and cleanup a spill that might affect surface waters or groundwater.

For the proposed AEHF activities, all program personnel would be required to comply with applicable Federal, Department of Defense, USAF, National Aeronautics and Space Administration, and state health and safety regulations and standards. By adhering to established and proven safety standards and procedures, the level of risk to all personnel and the public would be minimal. CCAFS personnel and contractors would manage all hazardous materials and wastes in accordance with well-established policies and procedures. Hazardous material and waste-handling requirements would not exceed current capacities and management programs would not have to change.

Global Environment

Regarding potential effects on the global atmosphere, there would be little or no ozone depleting substances used or released during the Proposed Action that would affect the stratospheric ozone layer. Additionally, the limited amount of greenhouse gas emissions would not contribute significantly to global warming. Each AEHF satellite is expected to remain in orbit and not re-enter Earth's atmosphere for hundreds if not thousands of years. For each mission, the EELV's Centaur upper stage rocket motor would be placed in a disposal orbit that would result in an uncontrolled atmospheric re-entry. The risk to populations on the ground, however, is not expected to be significant given the fact that there have been over 5,000 reported satellite and rocket body debris re-entries large enough to produce a casualty over the past 50 years of space launches with zero reported casualties.

PUBLIC REVIEW AND COMMENT: At CCAFS in Florida, the USAF published an availability notice for public review of the Draft EA and Draft Finding of No Significant Impact (FONSI) in the local newspaper on June 14, 2010, initiating a 15-day review period that ended on June 28, 2010. The USAF placed copies of the Draft EA, including the Draft FONSI, in local libraries and on the Internet at http://www.aehf-ea.com. There were no public comments received during the review period. Several agencies, however, responded with no comment, concurrence, or a determination that the project is consistent with applicable environmental requirements.

POINT OF CONTACT: The point of contact for questions, issues, and information relevant to the EA for AEHF is Mr. Adel Hashad, SMC/EAFV, 483 North Aviation Boulevard, El Segundo, California, 90245-2808. Mr. Hashad also can be reached by calling (310) 653-1217, by facsimile at (310) 653-1210, or by e-mail at Adel.Hashad@losangeles.af.mil.

CONCLUSION: An analysis of the Proposed Action concludes that its implementation will not have significant environmental impacts on the human and natural environment, either by itself or cumulatively with other actions. After thoroughly considering the facts herein, the undersigned finds that the Proposed Action is consistent with existing environmental policies and objectives set forth in NEPA and its implementing regulations. Therefore, an Environmental Impact Statement is not required.

APPROVED:

Chris Puckett

CHRIS PUCKETT, SES, DAF
Director of Installations and Logistics
Air Force Space Command

9 Jul 2010

DATE

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ACRONYMS AND ABBREVIATIONS

45 SW	45th Space Wing
AEHF	Advanced Extremely High Frequency
AFB	Air Force Base
AFI	Air Force Instruction
AFMAN	Air Force Manual
AFOSH	Air Force Occupational Safety and Health
AFSPC	Air Force Space Command
AICUZ	Air Installation Compatible Use Zone
AQCR	Air Quality Control Region
ASO	Astrotech Space Operations
C	Celsius
CAA	Clean Air Act
CCAFS	Cape Canaveral Air Force Station
CEMP	Comprehensive Emergency Management Plan
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CEQ	Council on Environmental Quality
CFC	chlorofluorocarbons
CFR	Code of Federal Regulations
CH_4	methane
CO	carbon monoxide
CO_2	carbon dioxide
COCO	Contractor Owned–Contractor Operated
dB	decibel
dBA	a-weighted decibels
DNL	day-night sound level
DoD	Department of Defense
DoDI	DoD Instruction
DOT	Department of Transportation
EA	Environmental Assessment
E_c	Debris Casualty Area
EELV	Evolved Expendable Launch Vehicle
EIS	Environmental Impact Statement
EOL	End-of-life
ESC	Environmental Support Contractor
F	Fahrenheit
FAC	Florida Administrative Code
FDEP	Florida Department of Environmental Protection
FL	Florida
FONSI	Finding of No Significant Impact
FSA	Fuel Storage Area
ft	Feet
FWC	Florida Fish and Wildlife Conservation Commission
FY	Fiscal Year
GEO	Geosynchronous
GHG	greenhouse gases
HazMart	Base Supply Hazardous Material Pharmacy
HAZMAT	Hazardous Material

IRP	Installation Restoration Program
KDP	Kennedy Document Procedure
kg	Kilogram
km	Kilometer
KNPR	Kennedy NASA Procedural Requirements
kph	Kilometers per Hour
KSC	John F. Kennedy Space Center
lb	Pound
LC	Launch Complex
Leq	equivalent sound level
LTO	landing and takeoff
LV	Launch Vehicle
m	Meter
MCCS	Mobile Constellation Control Station
MCSW	Military Satellite Communications Systems Wing
mi	Mile
MILSATCOM	Military Satellite Communication
MIL-STD	Military Standard
mph	Miles per Hour
N_2O	nitrous oxide
NAAQS	National Ambient Air Quality Standards
NASA	National Aeronautics and Space Administration
NCA	National Command Authorities
NEPA	National Environmental Policy Act
NESHAP	National Emission Standard for Hazardous Air Pollutants
NOAA	National Oceanic and Atmospheric Administration
NO_x	nitrogen oxides
NPR	NASA Procedural Requirements
OFW	Outstanding Florida Water
OPLAN	Operations Plan
OSHA	Occupational Safety and Health Administration
PEL	Permissible Exposure Level
PM_{10}	particulate matter less than 10 microns in diameter
$PM_{2.5}$	particulate matter less than 2.5 microns in diameter
ppm	parts per million
RCRA	Resource Conservation and Recovery Act
RF	Radio Frequency
ROI	Region of Influence
SLF	Shuttle Landing Facility
SMC	Space and Missile Systems Center
SO_2	sulfur dioxide
SPF	Spacecraft Processing Facility
SR	State Road
STD	Standard
SWI	Space Wing Instruction
US	United States
USAF	US Air Force
USC	United States Code
USDOT	US Department of Transportation
USEPA	US Environmental Protection Agency
USFWS	US Fish and Wildlife Service

VIF	Vehicle Integration Facility
WMO	World Meteorological Organization
$\mu g/m^3$	micrograms per cubic meter

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1.0 PURPOSE OF AND NEED FOR ACTION

1.1 INTRODUCTION

The Military Satellite Communications Systems Wing (MCSW), a joint program office whose executive service is the United States Air Force (USAF), is headquartered at the Space and Missile Systems Center (SMC), Los Angeles Air Force Base (AFB), California. The MCSW is the Department of Defense (DoD) acquisition office for developing and sustaining space-enabled, global communications capabilities in support of National objectives.

The DoD has authorized the MCSW to proceed with the beddown and deployment of the first of several Advanced Extremely High Frequency (AEHF) satellites. The new satellites would replace older Milstar satellites already in orbit. The USAF would process, beddown, and deploy the AEHF satellites from Cape Canaveral Air Force Station (CCAFS) in Florida (FL). This Environmental Assessment (EA) documents the results of a study of the potential environmental effects resulting from these actions.

The Purpose of an Environmental Assessment

An EA is prepared by a Federal agency to determine whether an action it is proposing would significantly affect any portion of the environment.

The intent of an EA is to provide project planners and Federal decision-makers with relevant information on the impacts that a proposed action might have on the human and natural environments.

If the study finds no significant impacts, then the agency shall record the results of that study in an EA and publish a Finding of No Significant Impact (FONSI). The agency may then proceed with the action.

However, if the results of the EA indicate that there would be potentially significant impacts associated with the action, then the agency must issue a Notice of Intent and prepare an Environmental Impact Statement (EIS).

In support of the MCSW, the SMC Civil and Environmental Management Division determined that an EA is required to assess the potential environmental effects from the satellite processing, beddown, deployment (launch into orbit), operations, and disposal activities associated with the AEHF system. This EA was prepared in accordance with the following regulations, statutes, and standards:

- National Environmental Policy Act (NEPA) (42 United States Code [USC] 4321-4370f)
- Executive Order 12114 (*Environmental Effects Abroad of Major Federal Actions*) (Office of the President, 1979)
- The President's Council on Environmental Quality (CEQ) Regulations for Implementing NEPA (40 Code of Federal Regulations [CFR] Parts 1500-1508) (CEQ, 2009)
- *Environmental Impact Analysis Process* (32 CFR Part 989) (USAF, 2009a)
- Air Force Policy Directive 32-70 (*Environmental Quality*)

1.2 BACKGROUND

The USAF currently operates the Milstar satellite system to provide Military Satellite Communication (MILSATCOM) to complement the Air Force's Satellite Communication System and the Defense

Satellite Communication System. Milstar utilizes integrated defense communications controlled from a small, continental United States-based force structure. The Milstar system was designed as an advanced communications network consisting of three primary elements: a constellation of six satellites, a satellite ground control system, and individual user terminals. Initially conceived in 1981, this system was designed to meet the joint service requirements to simultaneously provide: (1) the tactical forces with critical command and control communications; (2) the National Command Authorities (NCA) with Single Integrated Operation Plan execution; and (3) the Strategic Forces with direction and report back capability. The last Milstar satellite was deployed in 2003. Currently, five of the six Milstar satellites are operational. The third satellite launched in April 1999 was lost due to an upper stage booster failure.

The AEHF satellite system is the follow-on to the Milstar system, augmenting and improving on the capabilities of Milstar, and expanding the MILSATCOM architecture. The AEHF system would provide connectivity across the spectrum of mission areas, including: land, air, and naval warfare; special operations; strategic nuclear operations; strategic defense; theater missile defense; and space operations and intelligence.

1.3 PURPOSE OF THE PROPOSED ACTION

The purpose of the Proposed Action is to provide and maintain secure, survivable communications to the United States (US) warfighter. As a replacement for the current Milstar system, the new AEHF system would increase both the available single user data rate and total satellite capacity, while maintaining the essential features of the Milstar system. The AEHF system would provide essential, survivable, anti-jam communication services for the NCA and Commanders in Chief to ensure command and control of strategic and tactical forces in all levels of conflict.

1.4 NEED FOR THE PROPOSED ACTION

The National Defense Authorization Act for Fiscal Year (FY) 1991 directed the Secretary of Defense to develop and carry out a plan for either a restructured Milstar program or an alternative advanced communications satellite program. The objectives were to: (1) substantially reduce program costs; (2) increase system utility for tactical forces; and (3) eliminate unnecessary capabilities. In January 1991, the DoD reported to the congressional defense committees its plans for restructuring the Milstar program. Key changes to the program included maintaining the Milstar constellation size at no more than six satellites instead of the original eight, and increasing communications capacity. (US General Accounting Office, 1992)

The operational Milstar satellites currently in orbit have a design life of approximately 10 years from the time each satellite was deployed, and thus all of them will eventually require replacement in order to maintain the MILSATCOM architecture. While the current Milstar constellation is healthy, several of the satellites are approaching or are already operating beyond their design life.

Because the current Milstar satellites are at or near the end of their design life, the proposed AEHF system of up to six satellites is needed to: (1) maintain survivable, secure, protected, jam-resistant communications for high priority US military ground, sea, and air assets; and (2) satisfy congressional requirements for a more capable and cost effective global communications system for DoD operations. The new satellite design would take advantage of advances in technology to reduce launch weight and related cost, and improve overall system performance.

1.5 SCOPE OF THE ENVIRONMENTAL ASSESSMENT

This EA documents the environmental analysis of beddown, deployment, processing, pre-launch preparations, launch, operations, and eventual disposal for up to six AEHF satellites at CCAFS (Figure 1-1). Currently, the MCSW has procured three AEHF satellites, with options for three more. To conduct these operations at CCAFS, existing buildings and facilities located on and off base would be used. The satellites would be launched from an existing Launch Complex (LC) using Evolved Expendable Launch Vehicles (EELVs). The satellite launches would occur over an 11-year period from FY 2010 through FY 2020.

The environmental impacts resulting from EELV launch activities for various payloads, including AEHF satellites, were previously analyzed in the EELV Final EIS (USAF, 1998) and in the EELV Final Supplemental EIS (USAF, 2000). The two EELV documents assessed the development, deployment, and operation of EELV space launch systems—consisting of variations of the Atlas V and Delta IV launch vehicles—from both CCAFS and Vandenberg AFB, California. Because the EELV launches planned for the upcoming AEHF satellites would not substantially alter the findings described in the EELV EISs, this EA incorporates the launch effects by reference. Detailed analyses of the EELV program can be found in the two EISs, which are accessible over the Internet at http://www.aehf-ea.com. With regards to post-launch environmental impacts, this EA includes analysis of the AEHF satellites and the Atlas V launch vehicle's Centaur upper stage end-of-life operations and disposal.

Ground communications for the current Milstar satellites are performed from existing fixed sites at Schriever Air Force Base (AFB), Colorado, and Vandenberg AFB, California; and from three existing Mobile Constellation Control Stations (MCCSs). In preparation for operation of the new AEHF system, the USAF has implemented hardware and software upgrades to the Milstar fixed sites and the MCCSs. No construction or modification of buildings, support facilities, or structures is required in support of the AEHF ground communications. Potential environmental and human health and safety effects associated with the satellite ground control system were originally addressed in the *Environmental Assessment for MILSTAR I and II Satellite Vehicle* (USAF, 1994). To account for any changes in existing antenna operations and in safety standards for radio frequency (RF) radiation, the USAF developed a transmitter safety plan for AEHF ground antenna calibration (Massachusetts Institute of Technology Lincoln Laboratory, 2007). The plan describes appropriate exposure control measures for non-ionizing RF radiation. Based on re-calculations conducted by the USAF, the safe distances for the AEHF ground antennas were determined to be 580 feet (ft) (177 meters [m]) for controlled/occupational exposures and 1,600 ft (488 m) for uncontrolled/general public exposures.[1] Before the upgraded antennas are put into service for the AEHF system, the USAF performs a RF survey on the transceivers to verify the safe distances for each antenna, in accordance with Air Force Occupational Safety and Health (AFOSH) Standard 48-9 (*Radio Frequency Radiation Safety Program*). Depending on the survey results, radiation safety distance may be adjusted or various forms of antenna operating restrictions are put into place.

In accordance with the CEQ and USAF regulations for implementing NEPA (40 CFR 1502.14(d) and 32 CFR 989.8(d), respectively), this EA also analyzes the No Action Alternative that serves as the baseline from which to compare the Proposed Action. Under the No Action Alternative, the AEHF satellites would not be processed and deployed.

[1] The RF radiation safe distances were calculated in accordance with AFOSH Standard 48-9 and Federal Communications Commission OET Bulletin 65 (*Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Field*) using permissible exposure limits (PELs) derived from recommended exposure levels in Institute of Electrical & Electronics Engineers, Inc. Standard C95.1-2005 (*Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz*). The PEL is the exposure value to which an individual may be exposed to RF radiation without exhibiting damaging biological effects.

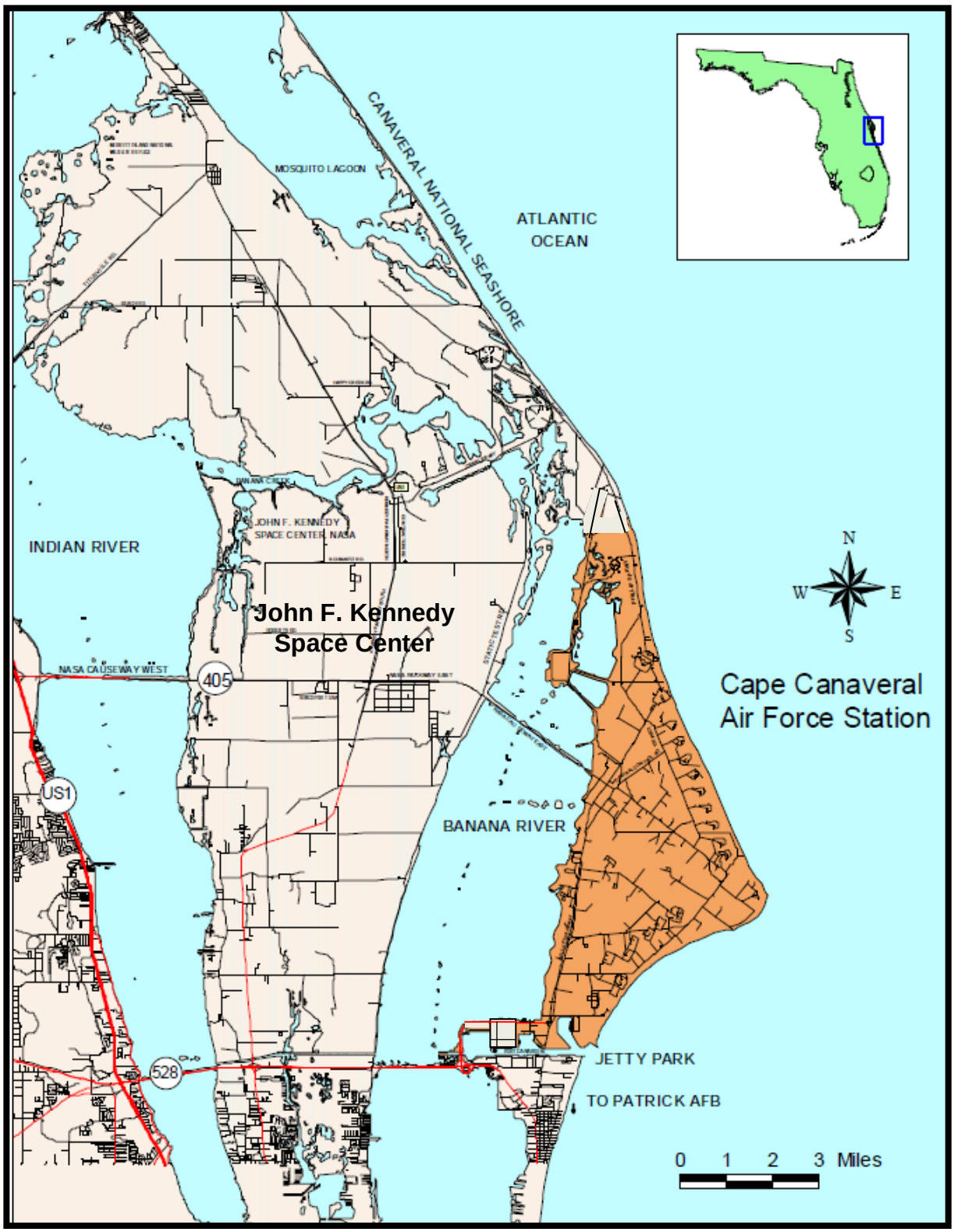

Figure 1-1. Location Map for Cape Canaveral Air Force Station and Vicinity

1.6 RELATED ENVIRONMENTAL DOCUMENTATION

The SMC Civil and Environmental Management Division relied on several existing NEPA documents to support the preparation of this EA. These documents are listed below and are cited in the EA where applicable:

- *Environmental Assessment for MILSTAR I and II Satellite Vehicle* (USAF, 1994)
- *Final Environmental Impact Statement—Evolved Expendable Launch Vehicle Program* (USAF, 1998)
- *Final Supplemental Environmental Impact Statement for the Evolved Expendable Launch Vehicle Program* (USAF, 2000)

1.7 DECISIONS TO BE MADE

Supported by the information and environmental analysis presented in this EA, the USAF will decide whether to implement beddown and deployment of AEHF satellites or to select the No Action Alternative.

1.8 PUBLIC REVIEW AND COMMENT PROCESS

In accordance with the CEQ (2009) and USAF (2009a) regulations for implementing NEPA, the USAF solicited comments on the Draft EA from interested and affected parties. A Notice of Availability for the Draft EA, and the enclosed Draft FONSI, was published on June 14, 2010 in the *Florida Today* newspaper for the CCAFS region. Copies of the Draft EA/Draft FONSI were placed in local libraries and were available over the Internet at http://www.aehf-ea.com. A list of agencies, organizations, and libraries that were sent copies of the document is provided in Chapter 8.0.

Following the 15-day public review period (as specified in the newspaper notices), the USAF received no public comments. Several agencies, however, responded with no comment, concurrence, or a determination that the project is consistent with applicable environmental requirements. Appendix B of this Final EA contains a reproduction of the agency responses received. A copy of the Final EA and the enclosed signed FONSI has been sent to those agencies, organizations, and individuals who provided comments on the Draft EA/Draft FONSI, or who specifically requested a copy of the final documents. The Final EA and signed FONSI are also available over the Internet at http://www.aehf-ea.com for a limited time.

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2.0 DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES

Within this chapter, Section 2.1 provides a description of the Proposed Action, including the AEHF satellites; processing and related pre-launch preparations; operations; and disposal. Section 2.2 provides a description of the No Action Alternative. A summary comparison of the environmental consequences associated with the Proposed Action and the alternative actions is presented in Section 2.3. Finally, identification of the Preferred Action is presented in Section 2.4.

2.1 PROPOSED ACTION

The USAF proposes to beddown, deploy, process, launch, operate, and eventually dispose of up to six AEHF communication satellites from CCAFS. Currently, the MCSW has procured three AEHF satellites, with options for three more. The processing of satellites would begin in FY 2010 and the first launch would occur the same year. The launches would occur at existing launch facilities as part of the ongoing EELV program. The deployment of AEHF satellites from CCAFS is scheduled to continue through FY 2020 with no more than two satellites being processed and launched in any one year.

2.1.1 SATELLITE DESCRIPTION

The AEHF satellite would weigh approximately 13,500 pounds (lb) (6,120 kilograms [kg]) at launch, including fuels for the propulsion system and solar cells for onboard electrical power. Figure 2-1 illustrates the AEHF satellite in its deployed configuration. The AEHF satellite would use a dual mode propellant system for orbit maintenance and orbit transfer. In addition to liquid hypergolic propellants (nitrogen tetroxide and hydrazine), the satellite would include an electric propulsion system with Xenon gas as the propellant. The electric propulsion system would be utilized to perform a portion of the orbit transfer requirements and the majority of orbital station keeping requirements.

Table 2-1 lists the satellite's key subsystem characteristics. As shown in the table, the AEHF satellite would contain various hazardous materials, including toxic metals, batteries, and propellants. Each battery vessel would be environmentally qualified, including safeguards for containing accidental hazardous battery casing leakage or electrical anode/cathode shorting. The onboard liquid propellant tanks are also constructed using high safety standards and undergo rigorous environmental testing and inspections to ensure no leakage. All explosive materials and devices would be handled in accordance with DoD 6055.09-STD (*DoD Ammunition and Explosives Safety Standards*).

2.1.2 SATELLITE PROCESSING AND PRE-LAUNCH PREPARATIONS

CCAFS falls under the command of the 45th Space Wing (45 SW) headquartered at Patrick AFB, which is located about 10 miles (mi) (16 km) south of CCAFS. As part of the Eastern Range,[2] CCAFS supports a wide range of space launches for both US Government and commercial satellites.

[2] The Eastern Range extends more than 10,000 mi (16,100 km) from the Florida mainland through the South Atlantic and into the Indian Ocean. It includes the launch head at CCAFS and a network of instrumentation stations, such as the Malabar and Jonathan Dickinson Tracking Annexes that are also in Florida, and down-range sites at Antigua Air Station and Ascension Auxiliary Air Field.

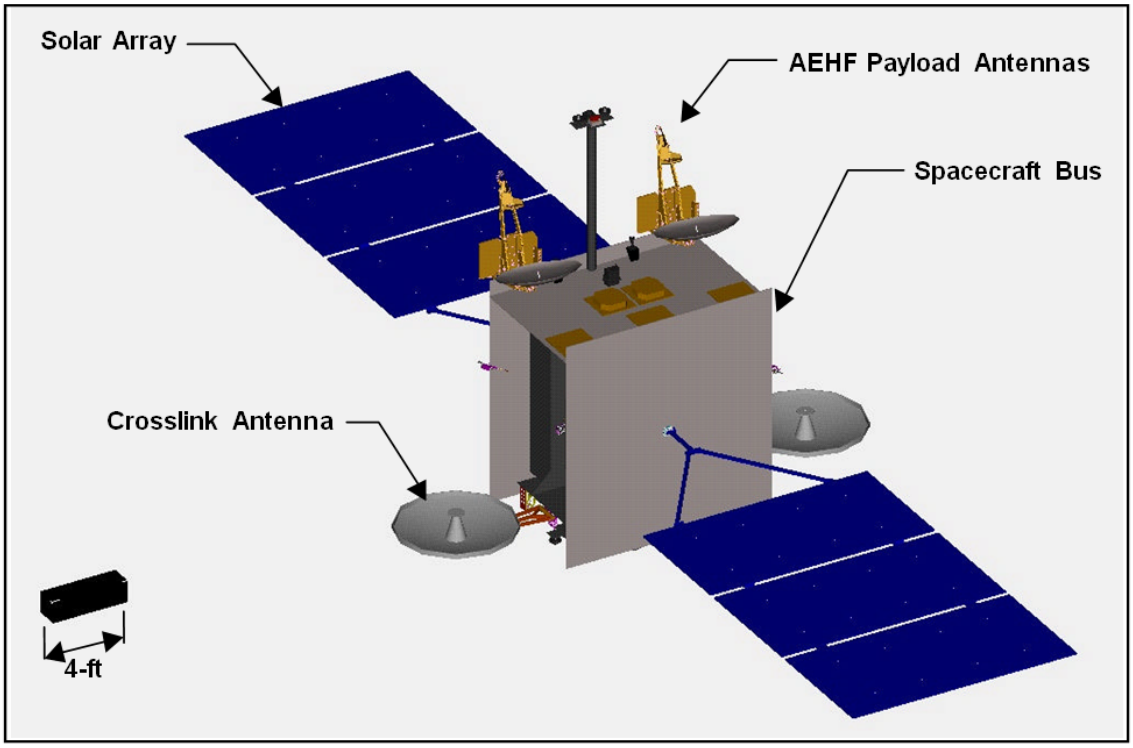


Figure 2-1. Deployed Configuration of the AEHF Satellite

Table 2-1. AEHF Satellite Subsystem Characteristics	
Bus Structure and other metal components	Aluminum, steel, carbon composites, and other alloys including the following amounts: approximately 52 lb (24 kg) of beryllium-aluminum alloy
Thermal Control Subsystem	Approximately 23 lb (10.4 kg) of anhydrous ammonia in heat pipes
Electrical Power Subsystem	Two 39-cell batteries containing a total of approximately 95 lb (43 kg) of potassium hydroxide electrolyte
	Two solar array wing assemblies
Dual-mode Propulsion Subsystem and the Attitude Control	Liquid fuel: approximately 2,066 lb (937 kg) of hydrazine
	Liquid oxidizer: approximately 1,733 lb (786 kg) of nitrogen tetroxide
	Pressurant gas: approximately 30 lb (14 kg) of helium
	Electrical propellant: approximately 909 lb (412 kg) of gaseous Xenon
Electro-explosive Devices	78 small Class B USDOT Class/Division 1.4) pyrovalves, separation nuts, and initiators to deploy solar arrays and antennas, and control propellant and helium gas flow

2.1.2.1 Satellite Transport, Processing, Fueling, and Encapsulation

Prior to shipment from the manufacturer, the AEHF satellite would contain all of the components and materials listed in Table 2-1, with the exception of the hypergolic liquid propellants, gaseous Xenon propellant, helium gas, and several of the electro-explosive devices. At the manufacturer's facility in Sunnyvale, California, the satellite would be placed in a sealed "clean" container. To avoid potential contamination of the satellite, the container would be purged with dry air or nitrogen gas. The manufacturer would then ship the containerized satellite by truck to Moffett Federal Airfield, which is located just north of Sunnyvale. In preparation for shipping the satellites, the USAF has developed a transportation plan specific to the AEHF satellites, which identifies shipping and handling procedures, safety requirements, and any necessary permits. Such requirements may include electrostatic discharge precautions, oxygen level testing due to potential inert atmospheres, US Department of Transportation (USDOT) labels and placards for applicable hazardous materials, access to relevant Material Safety Data Sheets, and obtaining state-level department of transportation overwidth permits.

At Moffett Federal Airfield, the containerized satellite would be loaded onto a USAF C-5 air transport and flown to the John F. Kennedy Space Center (KSC), FL. Located just north and west of CCAFS (see Figure 1-1), KSC is operated by the National Aeronautics and Space Administration (NASA) and it is the launch site for the Space Shuttle Program. The C-5 air transport would arrive at the Shuttle Landing Facility (SLF). Prior to offloading the shipping container from the aircraft, it would be inspected for any damage and for any invasive flora or fauna. The containerized satellite would then be loaded onto a special transporter vehicle.

From the SLF, the containerized AEHF satellite would be trucked to the satellite processing facility located at the Astrotech Space Operations (ASO) Spacecraft Processing Facility (SPF) in Titusville, FL (see Figure 2-2). The ASO SPF is a contractor owned–contractor operated (COCO) facility with the capability to process satellites with a 5-meter payload fairing. As a COCO facility, ASO would be responsible for obtaining all required environmental operating permits, and complying with appropriate health and safety procedures, rules, regulations, and laws, that are related to satellite testing, liquid propellant loading, and satellite encapsulation activities for AEHF missions.

In support of the AEHF satellite processing activities at the SPF, the USAF would provide the liquid hypergolic propellants. ASO contractors would truck separately several USDOT certified storage containers of fuel or oxidizer from CCAFS's Fuel Storage Area (FSA)-1 to the SPF in Titusville. Fuel transport trucks would follow the NASA Parkway and NASA Causeway (State Road [SR] 405 west) to reach Titusville. ASO would arrange for Department of Transportation (DOT) permits and security escorts for all propellant transports. At the completion of each fueling operation at the SPF, the fuel storage containers and any surplus fuel and oxidizer would be returned to FSA-1 for recycling and recertification for use by other programs at CCAFS.

At the completion of satellite processing, fueling, and satellite encapsulation activities, USAF contractors would use a specialized transporter to move the encapsulated satellite (payload) from the SPF to CCAFS. From Titusville, the transporter would follow SR-405 east to reach CCAFS. Prior to leaving the SPF, USAF contractors would arrange for DOT permits and security escorts.

2.1.2.2 Satellite-to-Launch Vehicle Mate Operations

Upon arrival on CCAFS, the transporter would take the encapsulated payload to the Vehicle Integration Facility (VIF), which is located just south of LC-41 (Figure 2-2). At the VIF, the encapsulated payload would be mated to the Atlas V Launch Vehicle (LV) using a mobile service tower crane and electronic

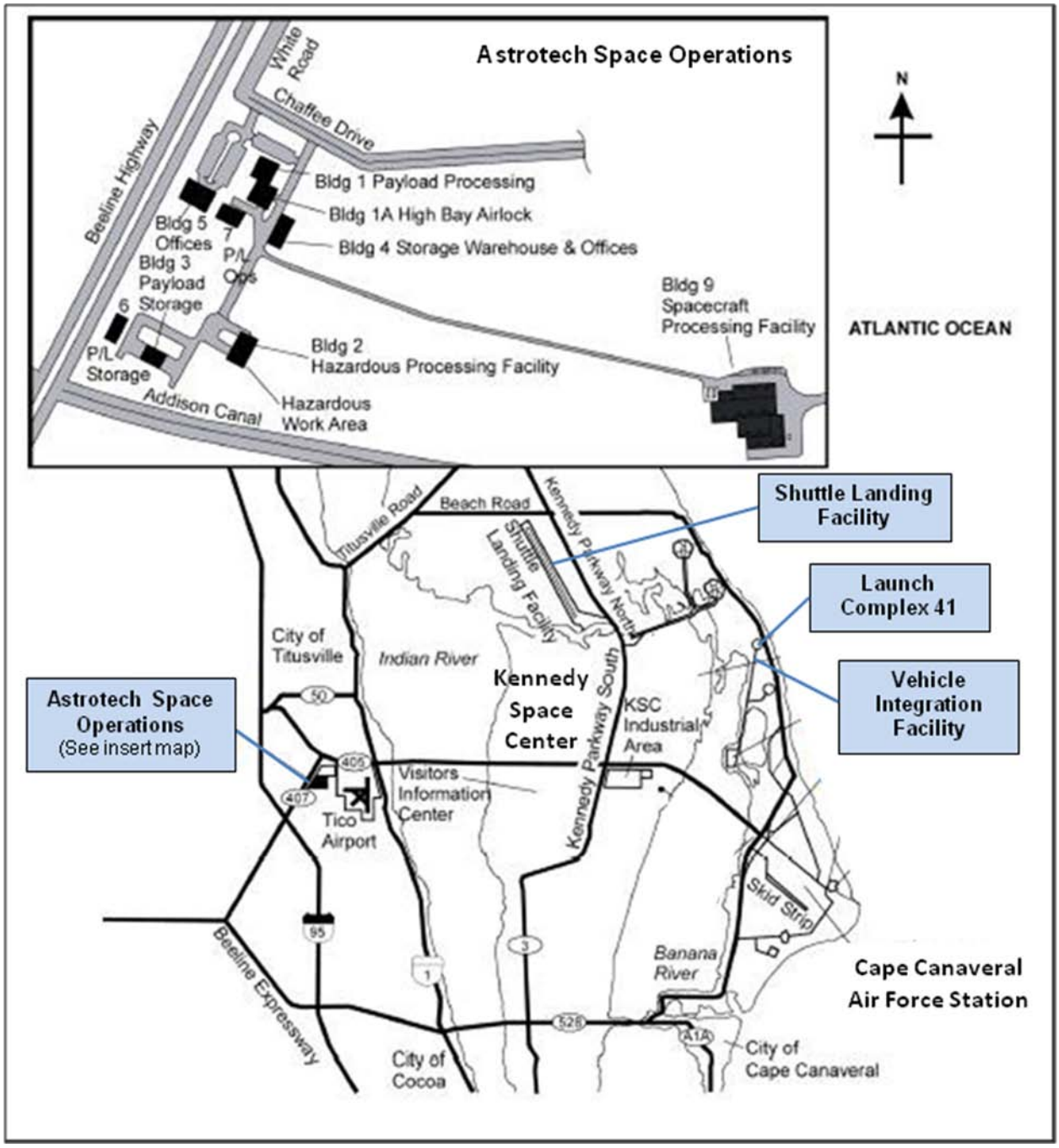


Figure 2-2. Location of Facilities Proposed for AEHF Satellite Processing and Pre-Launch Operations

functional checks would be performed. The integrated payload and LV would then be rolled to LC-41 on the Mobile Launch Platform. During final preparations prior to launch, the satellite would undergo functional checks, electrical checks, arming/enable procedures, and battery charging. In addition to the hypergolic liquid propellants contained in the encapsulated payload, small amounts of hazardous materials would be used during this integration process. A list of the types and quantities of materials to

be used for a single satellite mission are listed below. Use of these materials would also generate several pounds of hazardous waste in the form of residual materials, rags, hand-wipes, and work gloves.

- Isopropyl alcohol cleaning solvent (approximately 0.5 gallon [1.9 liters])
- Paints and lacquer thinners (less than 0.5 gallon [1.9 liters])
- Sealants and adhesives (less than 0.5 gallon [1.9 liters])

For each AEHF satellite, the nominal timeline from arrival at KSC to launch at CCAFS is approximately 48 days.

The activities associated with Atlas V launch vehicle processing and launch activities are described and analyzed in the EELV Final EIS (USAF, 1998) and in the EELV Final Supplemental EIS (USAF, 2000). Accordingly, this EA assesses the effects of conducting such launch activities by incorporating the EISs by reference.

2.1.3 END-OF-LIFE AND DISPOSAL OPERATIONS

Each AEHF satellite would be launched as a single manifest payload on an Atlas V booster from CCAFS. Following in-flight separation from the Atlas V main engine, the Centaur upper stage undergoes two separate engine firings and a coasting phase prior to AEHF satellite separation. Following separation, the Centaur upper stage is left in a highly elliptical disposal orbit. To reach operational orbit, the AEHF satellite uses the onboard hydrazine and oxidizer bipropellants to perform a series of transfer orbit maneuvers. During this phase, the solar array panels are deployed. The timeline from launch until the satellite reaches the target orbit lasts approximately 105 days. Once deployed, the AEHF space system would consist of up to six satellites in geosynchronous (GEO) low-inclined orbits. The full constellation would provide worldwide connectivity from 65 degrees South latitude to 65 degrees North latitude without reliance on any ground relay stations.

Each AEHF satellite has an operational design life of approximately 14 years. Towards the end of design life, as onboard systems begin to fail, End-of-Life (EOL) disposal plans would be implemented. At the end of each satellite's mission, the remaining propellant would be used to boost the satellite to a disposal orbit approximately 186 mi (300 km) above the original GEO orbit. Once the satellite reaches disposal orbit, EOL measures are implemented to mitigate against potential space debris. The EOL safing procedures for AEHF disposal have not been finalized, but after the satellite is moved into the disposal orbit, the procedures are expected to include:

- Safing pressurized systems[3]
- Disabling battery charging systems
- Leaving batteries in a discharged state
- Disabling transmitters
- Turning off all active thermal control systems
- Spinning the satellite at a slow rate to ensure uniform thermal exposure
- Turning off all attitude control systems
- Venting any remaining propellants

Once in disposal orbit, the satellite would remain in orbit for hundreds if not thousands of years.

[3] By "safing" pressurized systems, they are configured to ensure that there is no credible internal source for potential explosion.

2.2 NO ACTION ALTERNATIVE

Under the No Action Alternative, the proposed AEHF satellites would not be shipped to CCAFS for processing and deployment. The warfighter and other users would continue to rely on limited existing technology and capabilities of the Milstar satellite system. The Milstar constellation would gradually deteriorate until operational usefulness is no longer possible. As a result, US commanders would lose critical communication capabilities required for command and control during military operations.

2.3 COMPARISON OF ENVIRONMENTAL CONSEQUENCES OF THE PROPOSED ACTION AND ALTERNATIVES

Table 2-2 presents a comparison of the potential environmental consequences of the Proposed Action and the No Action Alternative for those locations and resources affected. Only those resource areas potentially affected are addressed (see Chapter 3.0 for a rationale of resources not analyzed). A detailed discussion of the potential effects is presented in Chapter 4.0 of this EA.

2.4 IDENTIFICATION OF THE PREFERRED ACTION

The USAF's Preferred Action is to implement the Proposed Action at CCAFS, as described in Section 2.1 of this EA.

Table 2-2. Comparison of Potential Environmental Consequences		
Locations and Resources Affected	**Proposed Action**	**No Action Alternative**
Cape Canaveral Air Force Station and Vicinity		
Air Quality	During implementation of the Proposed Action, sources of air emissions would include satellite transport, and processing and pre-launch activities. The total direct and indirect emissions would conform completely to the Florida State Implementation Plan, not be regionally significant, and not contribute to a violation of CCAFS's or KSC's air operating permits or any air regulation. As a result, no significant impacts to air quality are expected.	The proposed activities would not be implemented; therefore, project related impacts to air quality would not occur. Conditions are not expected to change from that described for the Affected Environment in Section 3.1.1 of the EA.
Noise	Short-term negligible noise increases would occur primarily from the aircraft landing and takeoff operations up to two times per year. Noise levels during operations in the project area would not exceed ambient noise level standards as determined by the Federal, state, and/or local government. Overall, noise impacts would not be significant.	The proposed activities would not be implemented; therefore, project related impacts to the noise environment would not occur. Conditions are not expected to change from that described for the Affected Environment in Section 3.1.2 of the EA.
Water Resources	Because of the precautions taken by the USAF and their contractors to prevent accidental spills and leakage of liquid propellants, the risk for such an occurrence is low. If a hazardous material incident were to occur, appropriate emergency response resources are available within each affected jurisdiction (Brevard County, KSC, and CCAFS) to isolate, contain, and cleanup a spill that might affect surface waters or groundwater. As a result, no significant impacts to water resources are expected to occur.	The proposed activities would not be implemented; therefore, project related impacts to water resources would not occur. Conditions are not expected to change from that described for the Affected Environment in Section 3.1.3 of the EA.
Biological Resources	The Proposed Action would not involve any disturbance of vegetative habitats or off-road travel. Satellite processing and pre-launch operations would occur at existing facilities. Operations conducted at night would comply with existing light management requirements so as not to adversely affect sea turtles. Overall, the proposed activities are expected to have "no effect" on state and Federally listed species, which are managed in accordance with existing management plans for CCAFS. Thus, the proposed activities would have no significant impact on biological resources.	The proposed activities would not be implemented; therefore, project related impacts to biological resources would not occur. Conditions are not expected to change from that described for the Affected Environment in Section 3.1.4 of the EA.
Safety and Occupational Health	For the proposed AEHF activities, program personnel would be required to comply with applicable Federal, DoD, USAF, and NASA health and safety regulations and standards. The proposed satellite processing and pre-launch activities represent routine types of activities at all locations involved. By adhering to established and proven safety standards and procedures, the level of risk to all personnel and the public would be minimal. Thus, no significant impacts to safety and occupational health are expected.	The proposed activities would not be implemented; therefore, project related impacts on safety and occupational health would not occur. Conditions are not expected to change from that described for the Affected Environment in Section 3.1.5 of the EA.
Hazardous Materials and Waste Management	CCAFS personnel and contractors would manage all hazardous materials in accordance with well-established policies and procedures. Hazardous and non-	The proposed activities would not be implemented; therefore, project related impacts on hazardous

Table 2-2. Comparison of Potential Environmental Consequences		
Locations and Resources Affected	**Proposed Action**	**No Action Alternative**
	hazardous wastes would be properly disposed of in accordance with applicable Federal, state, local, DoD, and USAF regulations. Hazardous material and waste-handling requirements would not exceed current capacities and management programs would not have to change. As a result, no significant impacts from the management of AEHF-related hazardous materials and waste are expected.	materials and waste management would not occur. Conditions are not expected to change from that described for the Affected Environment in Section 3.1.6 of the EA.
Global Environment		
Global Atmosphere	There would be little or no ozone depleting substances used or released during the Proposed Action that would affect the stratospheric ozone layer. All combined AEHF activities by the USAF would generate approximately 2,139 tons (1,940 metric tons) of carbon dioxide (CO_2) per year for two satellites. This amount of CO_2 is expected to be less than 0.0001 percent of the anthropogenic emissions for this gas released on a global scale annually. The GHG emissions associated with the Proposed Action would also fall well below the threshold for annual emissions (27,563 tons [25,000 metric tons] of CO_2 equivalent emissions) specified in draft guidance by the CEQ. Thus, the Proposed Action would have no effect on the stratospheric ozone layer and would not contribute significantly to global warming.	The proposed activities would not be implemented; therefore, project related impacts on global warming and on the stratospheric ozone layer would not occur. Conditions are not expected to change from that described for the Affected Environment in Section 3.2.1 of the EA.
Re-entry Debris	Each AEHF satellite is not expected to generate re-entry debris during its operational life, and the satellites would likely remain in orbit and not re-enter Earth's atmosphere for hundreds if not thousands of years. For each mission, the Atlas V Centaur upper stage rocket motor would be placed in a disposal orbit that would result in an uncontrolled atmospheric re-entry. Accordingly the USAF will obtain a waiver prior to launch from the appropriate approving official(s) for any non-compliances with DoD and USAF requirements. The risk to populations on the ground, however, is not expected to be significant given the fact that there have been over 5,000 reported satellite and rocket body debris re-entries large enough to produce a casualty over the past 50 years of space launches with zero reported casualties.	The proposed activities would not be implemented; therefore, project related impacts from re-entry debris would not occur. Conditions are not expected to change from that described for the Affected Environment in Section 3.2.2 of the EA.

3.0 AFFECTED ENVIRONMENT

This chapter describes the environmental resources or topical areas that could potentially be affected by the Proposed Action. The information and data presented are commensurate with the importance of the potential impacts in order to provide the proper context for evaluating impacts. Sources of data used and cited in the preparation of this chapter include available literature (such as EAs, EISs, and other environmental studies), installation and facility personnel, and regulatory agencies.

The information contained in this chapter serves as the baseline against which the predicted effects of the Proposed Action can be compared. The potential environmental effects of the Proposed Action and No Action Alternative are discussed in Chapter 4.0.

3.1 CAPE CANAVERAL AIR FORCE STATION AND VICINITY

CCAFS encompasses over 17,000 acres (6,880 hectares) on the Canaveral Peninsula, a barrier island along the central Atlantic Coast of Florida (CCAFS, 2002). Located just south and east of the KSC (Figure 1-1), the station is well known for its early support of the Man in Space Program. Today, CCAFS continues to support numerous space launch missions for unmanned Government and commercial satellites, and for deep-space probes.

In conducting AEHF activities on CCAFS and at off-base locations, air quality, noise, water resources, biological resources, safety and occupational health, and hazardous materials and waste management (including pollution prevention) are the only areas of concern requiring discussion. No other environmental resource topics for the station are analyzed further because of the following reasons: (1) the Proposed Action requires no ground-disturbing activities, thus no impacts to archaeological resources, soils, or geologic resources would be expected; (2) there would be no modifications or changes in the current use of any historical facilities listed or eligible for listing on the National Register of Historic Places, including those that are part of the Man in Space Program; (3) the increase in new or transient personnel would be minimal, thus no socioeconomic concerns are anticipated; (4) given that the AEHF activities would occur primarily on government installations and at existing COCO facilities, there would be no disproportionate impacts to minority populations and low-income populations under Executive Order 12898 (*Federal Actions To Address Environmental Justice in Minority Populations and Low-Income Populations*); (5) the Proposed Action would not require any changes to airspace usage and only minor increases in aircraft operations; and (6) the proposed activities are consistent with the CCAFS General Plan (CCAFS, 2002) and are well within the limits of current operations at all on- and off-base facilities. The Florida Department of Community Affairs also found EELV-related operations at CCAFS (including payload processing) to be consistent with the Florida Coastal Zone Management Program (USAF, 1998). As a result, there would be no adverse effects on land use, utilities, or transportation.

3.1.1 AIR QUALITY

3.1.1.1 National Ambient Air Quality Standards and Attainment Status

The US Environmental Protection Agency (USEPA) Region 4 and the Florida Department of Environmental Protection (FDEP), regulate air quality in Florida. The Clean Air Act (CAA) (42 USC 7401-7671q), as amended, gives the USEPA the responsibility to establish the primary and secondary National Ambient Air Quality Standards (NAAQS) (40 CFR Part 50) that set acceptable concentration levels for seven criteria pollutants: fine particulate matter (PM_{10}), very fine particles ($PM_{2.5}$), sulfur

dioxide (SO_2), carbon monoxide (CO), nitrous oxides (NO_x), ozone, and lead. Short-term standards (1-, 8-, and 24-hour periods) have been established for pollutants that contribute to acute health effects, while long-term standards (annual averages) have been established for pollutants that contribute to chronic health effects. Each state has the authority to adopt standards stricter than those established under the Federal program; however, Florida accepts the Federal standards except for SO_2 for which the state standards are slightly more stringent (Table 3-1).

Air quality is measured and regulated on a regional level. Air Quality Control Regions (AQCRs) that exceed the NAAQS are designated as *nonattainment* areas and those in accordance with the standards are *attainment* areas. The General Conformity Rule (40 CFR Part 51, Subpart W, and 40 CFR Part 93) ensures that actions taken by Federal agencies in nonattainment and maintenance areas do not impede the state's ability to achieve the NAAQS in a timely fashion. Brevard County, and therefore all activities associated with the Proposed Action, is within the Southeast Florida Intrastate AQCR or AQCR 048 (40 CFR 81.49). Because the USEPA has designated Brevard County as in attainment for all criteria pollutants, the Federal air conformity rules and regulations do not apply to AEHF activities.

The Region of Influence (ROI) for the air quality analysis in this EA is AQCR 048 and those portions of Brevard County where the Proposed Action would occur. The FDEP monitors levels of criteria pollutants at representative sites in each region throughout Florida, and has two monitoring stations near CCAFS. The City of Melbourne regional air monitor is approximately 22 mi (35 km) south of CCAFS, and the Cocoa Beach monitor is 7 mi (11 km) from the station. For these two stations, Table 3-1 shows the monitored concentrations of ozone, SO_2, PM_{10}, and $PM_{2.5}$ for the past 3 years. No other criteria pollutants are monitored at these locations. Notably, the highest and 2nd highest 8-hour ozone level was greater than the NAAQS. However, the 3-year average of the fourth highest daily maximum concentrations (0.066 parts per million [ppm]) has not exceeded 0.08 ppm; hence the attainment status.

3.1.1.2 Regulatory Requirements and Existing Emissions

The Florida program for regulation of air emissions affects industrial sources, commercial facilities, and residential development activities. As part of these regulations, the FDEP oversees permitting for the construction and operation of new or modified stationary source air emissions in Florida. These requirements include, but are not limited to, Title V permitting of major sources, New Source Review, Prevention of Significant Deterioration, New Source Performance Standards for selected categories of industrial sources, and the National Emission Standard for Hazardous Air Pollutants (NESHAP).

Under FDEP's Title V Facility Permit regulations, a Title V Operating Permit is required for facilities whose potential emissions exceed major source thresholds for nonattainment pollutants. Both CCAFS and KSC are major sources of air emissions, and both maintain individual Title V permits (FDEP, 2007; NASA, 2008). Permitted stationary sources at the installations include boilers, generators, paint spray booths, abrasive blasting operations, and liquid propellant scrubbers (FDEP, 2007).

In addition to permitted stationary sources, CCAFS and KSC activities include emissions of fugitive dust from road travel, insignificant stationary sources, mobile sources (i.e., automotive exhaust, rocket launches, aircraft operations), and non-road sources (e.g., construction equipment). Because the area is in attainment for all criteria pollutants, FDEP does not maintain a comprehensive inventory of air emissions for the region.

3.1.1.3 Climate

The climate at the Canaveral Peninsula is characterized as maritime-tropical with humid summers and mild winters. Over 70 percent of the annual 48 inches (122 centimeters) of rain occurs during the

Table 3-1. Air Quality Standards and Ambient Air Concentrations at or Near CCAFS, FL

Pollutant	2006		2007		2008		Florida Standards[1]	Federal Standards[2]	
	Melbourne	Cocoa Beach	Melbourne	Cocoa Beach	Melbourne	Cocoa Beach		Primary[3]	Secondary[4]
Ozone (parts per million - ppm)									
8-hour highest[5]	0.086	0.088	0.070	0.081	0.071	0.077	0.075	0.075	Same as Primary
8-hour 2nd highest	0.078	0.083	0.068	0.073	0.070	0.074	-	-	-
SO_2 (ppm)									
3-hour highest			0.029		0.013		0.50	-	0.50
3-hour 2nd highest			0.024		0.012		-	-	-
24-hour highest	*(no data)*	*(no data)*	0.006	*(no data)*	0.004	*(no data)*	0.10	0.14	-
24-hour 2nd highest			0.005		0.003		-	-	-
Annual Arithmetic Mean			0.001		0.001		0.02	0.03	-
PM_{10} (micrograms per cubic meter - $\mu g/m^3$)									
24-hour highest	27	*(no data)*	74	*(no data)*	58	*(no data)*	150	150	Same as Primary
24-hour 2nd highest	26		34		43		-	-	-
$PM_{2.5}$ ($\mu g/m^3$)									
24-hour highest	36		23.5		21.3		-	35	Same as Primary
24-hour 2nd highest	34.7	*(no data)*	21.9	*(no data)*	19.9	*(no data)*	-	-	-
Annual Arithmetic Mean	8.99		7.29		8.03		15	15	Same as Primary

Notes:

[1] Florida standards for sulfur dioxide are not to be exceeded values.

[2] National averages (other than ozone, particulate matter, and those based on annual averages or annual arithmetic mean) are not to be exceeded more than once a year. The ozone standard is attained when the expected number of days per calendar year, with a maximum hourly average concentration above the standard, is equal to or less than one.

[3] National Primary Standards: The levels of air quality necessary, with an adequate margin of safety, to protect the public health.

[4] National Secondary Standards: The levels of air quality necessary to protect the public welfare from any known or anticipated adverse effects from a pollutant.

[5] Not to be exceeded by the 3-year average of the annual fourth highest daily maximum 8-hour average.

Sources: USEPA, 2010a; Florida Administrative Code (FAC) 62-204.240 (Ambient Air Quality Standards); 40 CFR Part 50; 73 FR 16436-16514

summer. Thunderstorms are a common occurrence during the summer months. Hurricanes can also occur, normally between August and October. (NASA, 2002; USAF, 1998)

Prevailing winds during the winter months are frequently from the north and west. During the spring, summer, and early fall, the prevailing winds shift and come out of the south and east. At the surface, moderate wind speeds of 5 to 10 miles per hour (mph) (8 to 16 kilometers per hour [kph]) are common. Under normal midday weather conditions, surface mixing occurs within an average daily maximum ceiling of 2,300 to 2,950 ft (700 to 900 m) during the winter and 3,900 to 4,600 ft (1,190 to 1,400 m) during the summer. The mixed layer is rarely capped by strong temperature inversions. (NASA, 2002; USAF, 1998)

3.1.2 NOISE

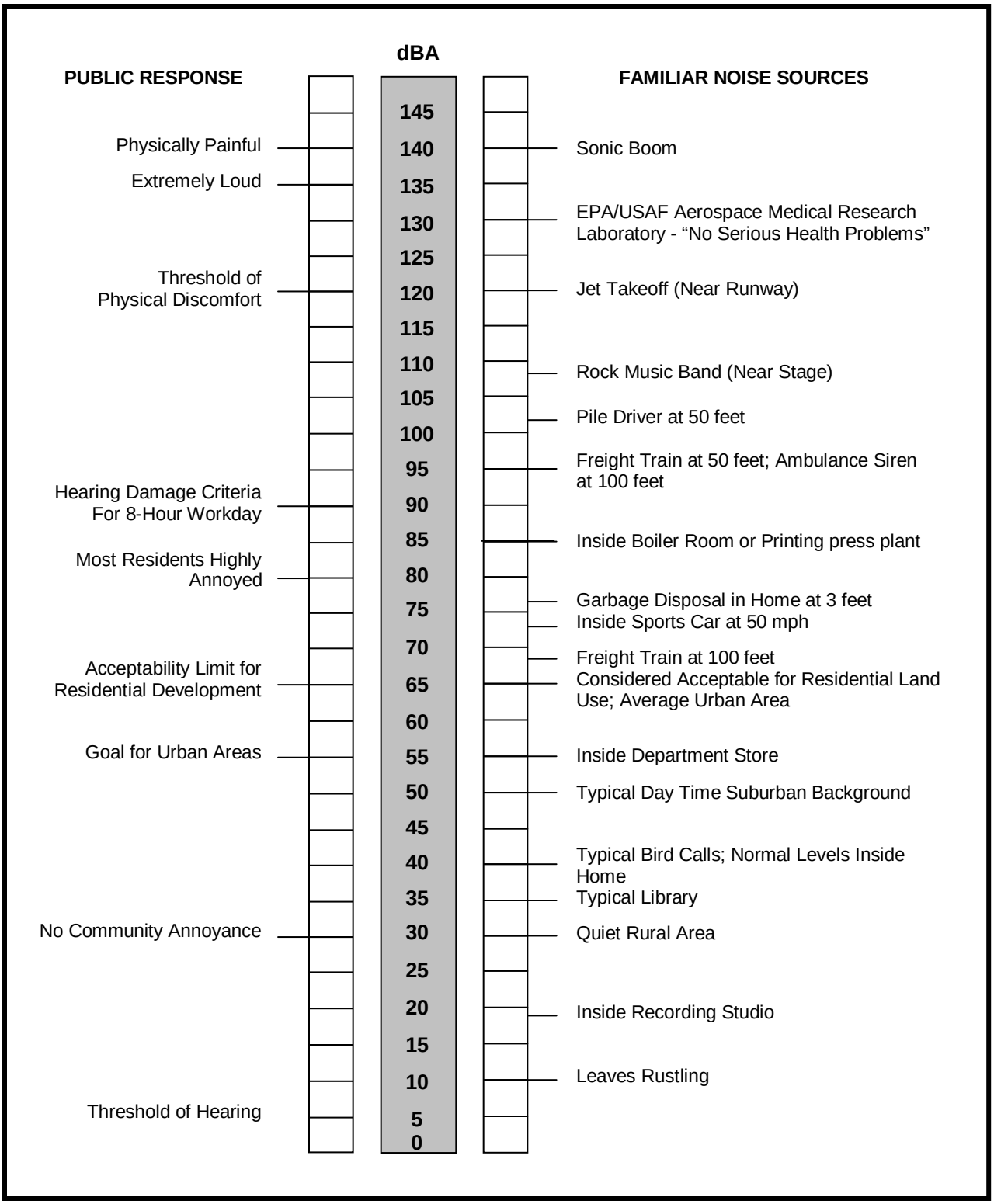
3.1.2.1 Noise Basics and Regulatory Overview

Noise is most often defined as unwanted sound that is heard by people or wildlife and that interferes with normal activities or otherwise diminishes the quality of the environment. Sources of noise may be transient (e.g., a passing train or aircraft), continuous (e.g., heavy traffic or air conditioning equipment), or impulsive (e.g., a sonic boom or a pile driver). Sound varies by both intensity and frequency. Sound pressure level, described in decibels (dB), is used to quantify sound intensity. The dB is a logarithmic unit that expresses the ratio of a sound pressure level to a standard reference level. Hertz are used to quantify sound frequency. The human ear responds differently to different frequencies. Sound-pressure levels are often adjusted for certain frequency bands, which are referred to as weighted sound levels. A-weighted decibels (dBA) approximate sound frequencies perceived by humans. Sounds encountered in daily life and their expected dBA levels are provided in Figure 3-1.

The dBA noise metric describes steady noise levels. Very few noises are, in fact, constant, so a noise metric day-night sound level (DNL) has been developed. DNL is defined as the average sound energy in a 24-hour period with a 10-dB penalty added to nighttime levels (10 PM to 7 AM). DNL is a useful descriptor for noise because it averages ongoing yet intermittent noise, and it measures total sound energy over a 24-hour period. In addition, equivalent sound level (Leq) is often used to describe the overall noise environment. Leq is the average sound level in dB.

AFOSH Standard 48-20 (*Occupational Noise and Hearing Conservation Program*) describes the USAF Hearing Conservation Program procedures used at CCAFS. Similarly at KSC, NASA complies with Occupational Safety and Health Administration (OSHA) standards for noise exposure to personnel (29 CFR 1910.95, *Occupational Noise Exposure*). Both USAF and OSHA standards require monitoring of employees when exposure to noise could equal or exceed an 8-hour time-weighted average of 85 dBA. Personal noise protection is required when using noise-hazardous machinery or entering hazardous noise areas.

The Noise Control Act of 1972 (Public Law 92-574) directs Federal agencies to comply with applicable Federal, state, interstate, and local noise control regulations. In 1974, the USEPA provided information suggesting that continuous and long-term noise levels in excess of DNL 65 dBA are normally unacceptable for noise-sensitive land uses, such as residences, schools, churches, and hospitals (USEPA, 1974). The state of Florida has no statewide noise regulation; however, the City of Cape Canaveral and Brevard County maintain a general nuisance noise ordinance, neither of which contains explicit not-to-exceed noise levels.



Source: Modified from US Army Strategic Defense Command, 1991

Figure 3-1. Typical Noise Levels of Familiar Noise Sources and Public Responses

3.1.2.2 Existing Noise Environment

For noise analysis purposes in this EA, the ROI at CCAFS and KSC is defined as those areas in proximity of the AEHF support facilities. Existing sources of noise near the project site include aircraft and space shuttle operations, local road traffic, and occasional rocket launches.

Noise levels around facilities at CCAFS approximate those of typical urban industrial areas, reaching 60 to 80 dBA. Infrequent aircraft flights and rocket launches temporarily increase noise levels for brief periods. Because of the limited annual number of aircraft operations at the Skid Strip—1,535 operations in 2009—no zones of incompatible land use are generated due to aircraft flights; therefore, the station is exempt from the Air Installation Compatible Use Zone (AICUZ) study requirements (Bron, 2010; CCAFS, 2002).

Noise generated at KSC can be attributed to several sources including Space Shuttle operations and launches, aircraft operations, industrial sources, construction, and traffic. The highest recorded noise levels in the area are those produced by Space Shuttle launches. Space Shuttle launch noise at Port Canaveral, located just south of CCAFS, would be typical for an industrial area, reaching 60 to 80 dBA (NASA, 2002). In general, the DNL at KSC is appreciably lower than 65 dBA except in areas immediately surrounding the SLF (NASA, 2008). Although the SLF is a limited-use airfield, there are approximately 3,430 aircraft operations at the facility per year (AIRNAV, 2010).

The relative isolation of CCAFS and KSC reduces the potential for noise to affect adjacent communities. There are no residential areas or other sensitive receptors within several miles of the Government project sites. Surrounding communities typically have low overall DNLs—normally between 45 to 50 dBA (American National Standards Institute, 2003)—with higher levels occurring in industrial areas and along transportation corridors. These levels are consistent with the transportation route to and from the ASO SPF in Titusville.

3.1.3 WATER RESOURCES

The FDEP's Office of Water Policy addresses statewide water management issues in coordination with the five water management districts that preserve and manage state water resources. For CCAFS, KSC, and other local areas, the St. Johns River Water Management District is the local agency responsible for managing groundwater and surface water supplies.

At CCAFS and other areas off base, the ROI for water resources includes those local surface water features and groundwater that could be adversely affected by AEHF support facilities or activities (e.g., water quality degradation).

3.1.3.1 Surface Water

CCAFS is within the Florida Middle East Coast Basin and situated on a barrier island that separates the Banana River from the Atlantic Ocean. This basin contains three major bodies of water: the Banana River immediately west of CCAFS, Mosquito Lagoon just north of KSC, and the Indian River located just west of KSC (see Figure 1-1). All three inland water bodies are estuarine lagoons, with circulation provided mainly by wind-induced currents. Portions of the Banana River, Mosquito Lagoon, and the Indian River have been designated as Outstanding Florida Water (OFW) per Florida Administrative Code (FAC) 62-302.700. These water areas are afforded the highest level of protection and any compromise of ambient water is prohibited. The Banana River has been designated a Class III surface water in accordance with Section 303(d) of the Clean Water Act (USAF, 2009b). Class III standards are intended to maintain a level of water quality suitable for recreation, and for the production of fish and wildlife

communities. The Indian River Lagoon System has also been designated an Estuary of National Significance by the USEPA (USAF, 2009b). Estuaries of National Significance are identified to balance conflicting uses of the nation's estuaries while restoring or maintaining their natural character.

In addition to estuarine and marine wetland areas, there are several thousand acres of lacustrine and palustrine wetlands scattered across CCAFS and KSC. Because of the relatively flat terrain, numerous man-made canals, ditches, and swales have been constructed over the years to facilitate surface water drainage around developed areas. There are no wetlands or permanent surface water bodies in the immediate area of the proposed AEHF support buildings and facilities. In addition, none of these buildings and facilities are located in the 100-year floodplain. (CCAFS, 2002; NASA, 2007)

3.1.3.2 Groundwater

Two aquifer systems underlie CCAFS, KSC, and much of the surrounding area: the surficial and the Floridan aquifer systems. The surficial aquifer system, which lies near the surface and to a depth of approximately 70 ft (21 m), has a water table generally only a few feet below ground level. Beginning at a depth of about 180 ft (55 m), the Floridan aquifer is the primary source of potable water in central Florida. A confining geologic unit with relatively low hydraulic conductivity separates the two aquifers. CCAFS and KSC receive their potable water from the City of Cocoa, which pumps water from the Floridan aquifer. (NASA, 2007; USAF, 1998, 2006a)

3.1.3.3 Water Quality

Groundwater in the surficial aquifer system at CCAFS and KSC remains in good quality because of immediate recharge, active flushing, and lack of development. The aquifer is, however, influenced by the intrusion of saline and brackish waters from the Atlantic Ocean and adjacent rivers. Although the surficial aquifer is classified by the FDEP as a potential potable water source, neither the USAF nor NASA have plans to use it as an additional source of potable water. (NASA, 2007; USAF, 2006a, 2009b)

Groundwater in the Floridan aquifer is highly mineralized. A treatment plant owned and operated by the City of Cocoa treats the groundwater prior to distribution to the local community, CCAFS, and KSC. In addition, the USAF recently upgraded the distribution facilities on CCAFS to improve water quality in the station's potable distribution system. (USAF, 2009b)

3.1.4 BIOLOGICAL RESOURCES

This section describes the existing vegetation and wildlife, including protected species and habitats, occurring at CCAFS. For purposes of analyzing biological resources, this EA limits the ROI to areas in the vicinity of the proposed AEHF support facilities, buildings, and operations.

3.1.4.1 Vegetation

At least 11 natural communities of vegetation exist on CCAFS, despite the communities being fragmented by mission-related construction and clearing activities. These communities include the beach dune, scrub, hydric hammock, coastal grassland, xeric hammock, estuarine tidal swamp, coastal strand, maritime hammock, estuarine tidal marsh, coastal interdunal swale and shell mound. Most of the vegetation consists of the indigenous Florida coastal scrub (including oak and rosemary scrub) and xeric and maritime hammocks. (USAF, 2006a)

Several invasive exotic plant species are also found on the station, particularly in disturbed areas such as along roadways and utility corridors. Such species include Brazilian pepper, Australian pine, and cogon grass. To limit further spread of invasive species, CCAFS has implemented an *Invasive Plant Species Control Plan* (USAF, 2006a).

Vegetation cover immediately surrounding the proposed AEHF support buildings and facilities is maintained primarily in grass cover. Beyond the maintained areas, vegetation is categorized as mostly coastal/oak scrub. (USAF, 1998)

3.1.4.2 Wildlife

The coastal scrub and associated woodlands provide habitat for mammals including the white-tailed deer, armadillo, bobcat, feral hog, long-tailed weasel, and the round-tailed muskrat. Several reptile and amphibian species observed at CCAFS include the spade foot and eastern narrow-mouth toads, squirrel and southern leopard frogs, American alligator, the Florida box turtle, the gopher tortoise, the Florida softshell, the broadhead skink, the southern ringneck snake, and the mangrove salt marsh snake. Numerous marine mammals populate the coastal and lagoon waters including the bottleneck dolphin, the spotted dolphin, and the manatee. (USAF, 2006a)

Approximately 175 land, shore, and sea bird species are known to occur on or in the vicinity of CCAFS, including numerous migratory birds (USAF, 2006a). CCAFS is situated along a major flyway route for migratory birds, all of which are protected at the Federal level by the Migratory Bird Treaty Act. Multiple species, including mockingbirds, ospreys, and great horned owls, have been documented nesting around the Proposed Action areas.

3.1.4.3 Threatened and Endangered Species

3.1.4.3.1 Listed Floral Species

There are no listed threatened or endangered plant species close to the proposed AEHF support facilities (Greenwade, 2010).

3.1.4.3.2 Listed Faunal Species

There are several listed wildlife species occurring within the ROI at CCAFS. These species are listed in Table 3-2 and are described in the paragraphs that follow.

Florida Scrub-Jay

The Florida Scrub-jay is a Federally threatened bird endemic to open, oak-dominated scrub habitats of Florida. The birds are also sometimes seen along grassy road shoulders and in mowed areas around buildings and facilities. Because the Scrub-jay is intimately tied to open, oak-dominated scrub, conservation of the species depends upon restoration of sufficient optimal habitat to support large populations. Believed to be one of the largest remaining populations, the CCAFS population has been designated as belonging to one of three core populations for the species. Consultations between the US Fish and Wildlife Service (USFWS) and the USAF led to the development of the *Florida Scrub-jay Operational Management Plan* for CCAFS in 1991. The *Scrub Habitat Operational Restoration Plan* was developed subsequent to the management plan, and provides a strategy for restoring scrub habitat for this species on the station. (Greenwade, 2010; USAF, 2006a)

Table 3-2. Threatened and Endangered Species Found in the Vicinity of the Proposed Action Areas at CCAFS, FL

Common Name	Scientific Name	Status	
		Federal	State
Birds			
Florida Scrub-jay	*Aphelocoma coerulescens*	T	T
Mammals			
Southeastern Beach Mouse	*Peromyscus polionotus niveiventris*	T	T
Reptiles and Amphibians			
American Alligator	*Alligator mississippiensis*	T(S/A)	SSC
Eastern Indigo Snake	*Drymarchon corais couperi*	T	T
Gopher Tortoise	*Gopherus polyphemus*	----	T
Atlantic Green Sea Turtle	*Chelonia mydas*	E	E
Atlantic Hawksbill Sea Turtle	*Eretmochelys imbricata imbratica*	E	E
Atlantic Loggerhead Sea Turtle	*Caretta caretta*	T	T
Kemp's Ridley Sea Turtle	*Lepidochelys kempi*	E	E
Leatherback Sea Turtle	*Dermochelys coriacea*	E	E

Notes:
E – Endangered
T – Threatened
SSC – Species of Special Concern
S/A – Similar in Appearance

Source: Greenwade, 2010; USAF, 2006a, 2009b

Southeastern Beach Mouse

The southeastern beach mouse is found along the entire reach of coastline on CCAFS, mostly within areas of coastal dune and coastal strand vegetation. Studies have also shown that beach mice are located in interior oak scrub sites, as well as at some buildings. Mice may be relocated out of a project area and/or the USFWS may issue a "take permit" to the proponent of the project. Trapping will normally be conducted prior to initiation of consultation with the USFWS so that presence of the species can be confirmed. All trapping is done in accordance with existing Scientific Collecting Permit WV05481a. This permit allows for the capture and release of beach mice by non-harmful means for status survey purposes. The USFWS determines what mitigation measures will be taken to reduce potential impacts to this species. (Greenwade, 2010; USAF, 2006a)

American Alligator

The American alligator is Federally listed as threatened because of its similarity in appearance to another endangered species, the American crocodile (*Crocodylus acutus*), which is not found in Brevard County. The American alligator has made a strong recovery in Florida. Alligators inhabit and reproduce in all CCAFS waters. The population is on an upward trend as indicated by numerous sightings each summer of juvenile alligators throughout the station's drainage canal system. (USAF, 2006a, 2006b)

Eastern Indigo Snake

The eastern indigo snake is locally abundant in parts of Florida, but as a top carnivore, population densities are typically low. The eastern indigo snake has been found on CCAFS and likely occurs throughout the station. This primarily diurnal snake is known to occur in most habitats and is often associated with gopher tortoise burrows, although this has never been observed on CCAFS. Major threats to the indigo snake on CCAFS are habitat loss and vehicle traffic. There has not been an installation-wide survey completed for indigo snakes; however, based on the different habitat types around the Proposed Action locations, it is likely to occur within these areas. The only time indigo snakes may be relocated is during relocation of gopher tortoises. In accordance with the USAF Gopher Tortoise Relocation Permit WR04151c, no more than one indigo snake may be relocated. (USAF, 2006a)

Gopher Tortoise

The gopher tortoise is listed as a threatened species in the state of Florida. Gopher tortoises favor dry upland habitat areas, including disturbed areas such as recent burn areas, road shoulders, fence lines, and dune areas. The tortoises are known to inhabit areas adjacent to the Proposed Action facilities and buildings. Gopher tortoises have been shown to be tolerant of human activities on the station. When a proposed activity is likely to disturb gopher tortoise burrows, station biologists will relocate impacted tortoises to other suitable areas. A *Gopher Tortoise Preservation Plan*, approved by the Florida Fish and Wildlife Conservation Commission (FWC), was developed that outlines procedures for relocating gopher tortoises on CCAFS. All tortoise relocations must be completed in accordance with the Gopher Tortoise Relocation Permit issued by the FWC to the USAF. The USAF is required to submit a report for each relocation project. (Greenwade, 2010; USAF, 2006a, 2006b)

Sea Turtles

Of the five sea turtles observed in the waters offshore at CCAFS (Table 3-2), all but the Hawksbill and Kemp's ridley sea turtles are known to nest on station beaches, including those beach areas adjacent to LC-41. Based on nest surveys conducted between 1986 and 2009, the average number of loggerhead and green sea turtle nests deposited annually is 2,199 and 51, respectively. In the 2009 survey, 1,601 loggerhead, 49 green, and 9 leatherback nests were observed. In 1984, the USAF initiated a *Sea Turtle Operational Management Program* for the conservation of nesting sea turtles at the station. This program involves the protection, conservation, and management of threatened and endangered sea turtles, and their nests at CCAFS. Biologists conduct daily nesting surveys from May through September to count and record nesting activities. Biologists also conduct turtle stranding and salvage operations, as well as nest relocation activities. All sea turtle work on CCAFS is permitted under the FWC Sea Turtle Permit No. 075. All personnel listed on the permit are properly trained. (Chambers, 2010; USAF, 2006a)

Research has shown that female sea turtles will avoid highly illuminated beaches and postpone nesting. Artificial lights have also resulted in hatchling mortality as disoriented hatchlings move toward these light sources rather than the ocean. As part of the Sea Turtle Operational Management Program, and in accordance with 45 Space Wing Instruction (SWI) 32-7001 (*Exterior Lighting Management*), the station has implemented Light Management Plans to minimize light impacts on sea turtles nesting on the beaches at night. Under the SWI requirements, organizations, tenants, and residents are responsible for minimizing exterior lighting from April 1 through October 31, between 9:00 pm and 6:00 am. Exterior lighting that is not mission-, safety-, or security-essential must be extinguished during this time frame. A USFWS issued Biological Opinion authorizes no more than 3 percent incidental take of sea turtles as a result of disorientation on CCAFS. (USAF, 2006a, 2009b)

3.1.5 SAFETY AND OCCUPATIONAL HEALTH

Safety and occupational health includes consideration of any activities, occurrences, or operations that have the potential to affect the well-being, safety, or health of workers or members of the general public. The primary goal is to identify and prevent accidents or impacts to onsite workers and the general public. Regarding health and safety at CCAFS and at off-base areas, the ROI is limited to the existing facilities and transportation routes supporting the AEHF program. The safety and health ROI includes government and military personnel, contractors, and the general public.

For the Proposed Action, safety and health risks exist primarily due to the potential for accidents occurring during transportation, construction activities, and facility operations. Typical hazards and accidents can include the following:

- Fires
- Explosions of flammable liquids, solids, or compressed gases
- Electrical shock or burns
- RF radiation from communication antennas
- Inhalation or dermal exposure to hazardous materials or waste
- Asphyxiation from inert atmospheric conditions
- Spills of chemicals and fuels
- Falling debris related to construction
- Falls from structures
- Accidents related to earth-moving equipment, power tools, and other machinery
- Transportation accidents (air and land)

To help ensure the safe conduct of operations at CCAFS and other bases, the USAF has developed policies and procedures for implementing safety and health requirements. Air Force Policy Directive 91-2 (*Safety Programs*) establishes the USAF's key safety policies and also describes success-oriented feedback and performance metrics to measure policy implementation. More specific safety and safety-related DoD and USAF requirements, procedures, and standards relevant to the Proposed Action are listed below.

- DoD 6055.09-STD (*DoD Ammunition and Explosives Safety Standards*) establishes uniform safety standards applicable to ammunition and explosives (including propellants), to associated personnel and property, and to unrelated personnel and property exposed to the potential effects of an accident involving ammunition and explosives during their development, manufacturing, testing, transportation, handling, storage, maintenance, demilitarization, and disposal.

- Air Force Instruction (AFI) 91-202, Air Force Space Command (AFSPC) Supplement 1 (*The US Air Force Mishap Prevention Program*) implements the USAF's Safety Program for determining and applying standards to help eliminate unsafe acts or conditions that cause mishaps.

- AFI 91-204 (*Safety Investigations and Reports*) provides guidance that is common to investigating and reporting all USAF mishaps.

- AFI 91-301, AFSPC Supplement 1 (*Air Force Occupational and Environmental Safety, Fire Protection, and Health*) summarizes USAF requirements for the protection of safety and health. Safety and health hazards are to be minimized through appropriate engineering controls, personal protective equipment, and administrative procedures.

- AFSPC Manual 91-710 (AFSPCMAN 91-710) (*Range Safety User Requirements)* defines safety requirements related to the design of flight hardware and ground support equipment, as well as safety requirements for operating such hardware and support equipment while at CCAFS.

- AFI 91-217 (*Space Safety and Mishap Prevention Program*) provides overarching space safety, mishap prevention, and mission effectiveness guidance for acquisition, testing, and operations of terrestrial, launch, and orbital space systems.

- AFOSH Standard 48-9 (*Radio Frequency Radiation Safety Program*) specifies RF radiation safety requirements and identifies PELs.

- Air Force Manual (AFMAN) 91-201 (*Explosive Safety Standards*) implements DoD 6055.09-STD and establishes a central source for explosive safety criteria within the USAF.

- DoD Military Standard 882C (MIL-STD-882C) (*System Safety Program Requirements*) describes an approach useful in the management of environmental, safety, and health mishap risks encountered in the development, test, production, use, and disposal of DoD systems, subsystems, equipment, and facilities.

NASA also has in place similar safety requirements, procedures, and standards for operations at KSC that are relevant to the Proposed Action, which are listed below.

- NASA Procedural Requirements (NPR) 8715.3C (*NASA General Safety Program Requirements*) provides the basis for the NASA Safety Program including public safety.

- NASA Standard (STD)-8719.12 (*Safety Standard for Explosives, Propellants and Pyrotechnics*) establishes uniform safety standards applicable to the handling, transportation, and storage of propellants, pyrotechnics and other explosive materials.

AEHF contractors working on CCAFS and KSC would follow applicable Occupational Safety and Health Administration (OSHA) regulatory requirements (29 CFR), except when DoD, USAF, or NASA-specific requirements apply. Transportation of AEHF satellites and propellants over public roads would need to comply with USDOT regulations in 49 CFR 100-185 and applicable Florida DOT regulations. Implementation of these regulatory requirements and procedures ensure that there is minimal risk to the health and safety of installation personnel and contractors, as well as to the general public, from AEHF-related activities.

Both CCAFS and KSC possess significant emergency response capabilities that include their own fire departments, emergency response teams, and security police forces. Depending on the situation and location, disasters or emergencies within the area could warrant assistance from a local Government agency or jurisdiction. CCAFS and KSC have an agreement to provide mutual aid (i.e., fire, rescue, emergency management, medical) to each agency to ensure the protection of life and property (45 SW and KSC, 2009). Both CCAFS and KSC have also established mutual aid agreements with Brevard County and local municipalities. KSC, for example, has a mutual aid agreement with the city of Titusville (KSC and City of Titusville, 2009).

3.1.6 HAZARDOUS MATERIALS AND WASTE MANAGEMENT

For the analysis of hazardous materials and waste management at CCAFS and at off-base areas, the ROI is defined as those AEHF support facilities that: (1) store and handle hazardous materials; (2) collect,

store (on a short-term basis), and ship hazardous waste; and (3) are in proximity to environmental restoration sites that were previously contaminated. The ROI also includes those public and non-public transportation routes used to transport the AEHF satellites and propellants.

Hazardous materials and waste management activities are governed by specific environmental regulations. For the purposes of the following discussion, the term "hazardous materials or hazardous waste" refers to those substances defined as hazardous by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 USC Section 9601-9675, as amended. In general, this includes substances that, because of their quantity, concentration, or physical, chemical, or infectious characteristics, may present substantial danger to the public health, welfare, or the environment when released. Regulated under the Resource Conservation and Recovery Act (RCRA), 42 USC Section 6901-6991, hazardous waste is further defined in 40 CFR 261.3 as any solid waste that possesses any of the hazardous characteristics of toxicity, ignitability, corrosiveness, or reactivity.

3.1.6.1 Hazardous Materials Management

On CCAFS, organizations are required to manage hazardous materials through the Base Supply Hazardous Material Pharmacy (HazMart). The HazMart is the single point of control and accountability for the requisitioning, receipt, distribution, issue, and reissue of hazardous materials on the station. Hazardous materials obtained from off-base suppliers are also coordinated through the HazMart. All hazardous materials are inventoried and tracked using the USAF-approved tracking system. These procedures are in accordance with the 45 SW Operations Plan (OPLAN) 19-14 (*Waste Petroleum Products and Hazardous Waste Management Plan*). The Joint Propellants Contractor on station controls the purchase, transport, and temporary storage of hazardous propellants, including liquid hypergolic propellants.

The transportation of hazardous materials on public roads outside CCAFS and KSC boundaries is governed by the USDOT regulations within 49 CFR 100-185.

3.1.6.2 Hazardous Waste Management

Hazardous waste management at CCAFS is regulated under RCRA and FAC 62-730. The disposition of hazardous wastes is typically handled by the 45 SW's Environmental Support Contractor (ESC). The ESC is responsible for ensuring that hazardous waste disposal services comply with all applicable regulations governing the handling, transportation, storage, treatment, and disposal/reclamation of the waste, including excess or contaminated propellants and propellant-related wastes. At CCAFS, the applicable regulations, plans, and procedures for implementing hazardous waste management requirements, pollution prevention, and responding to spills and related emergencies are as follows:

- 45 SW OPLAN 19-14 (*Waste Petroleum Products and Hazardous Waste Management Plan*) addresses the proper identification, management, and disposition of hazardous waste generated at the station.

- 45 SW *Pollution Prevention Management Action Plan* for Patrick AFB and CCAFS establishes the overall strategy, responsibilities, and specific objectives for reducing pollution in the environment at the installations.

- 45 SW *Comprehensive Emergency Management Plan* (CEMP) 10-2, Volumes I and II, establishes uniform policy guidelines for the effective mitigation of, preparation for, response to, and recovery from a variety of emergency situations (e.g., hazardous material incidents, terrorist attacks, and natural disasters). It outlines and describes specific actions to be accomplished

during an event or contingency that would negatively impact CCAFS or surrounding areas. The CEMP is applicable to all USAF and contractor organizations, and to all other Government agencies located on the station.

NASA also has in place similar regulations, plans, and procedures at KSC that are relevant to the Proposed Action, which are listed below.

- Kennedy NASA Procedural Requirements (KNPR) 8715.2 (*Comprehensive Emergency Management Plan* [CEMP]) establishes uniform requirements for the effective preparation for, mitigation of, response to, and recovery from a variety of emergency situations.

- Kennedy Documented Procedure (KDP) KDP-KSC-P-3008 (*Hazardous Materials Emergency Response*) provides employees emergency response procedures for the reporting, control, and cleanup of a hazardous material release. This KDP applies to all civil servants and contractor organizations operating within the boundaries of KSC.

The transportation of hazardous wastes on public roads outside CCAFS and KSC boundaries is governed by the USDOT regulations within 49 CFR 100-185.

Both CCAFS and KSC have hazardous material (HAZMAT) response teams to respond to major accidents involving hazardous materials and wastes. Such teams and their support contractors are trained to isolate and contain any spillage, and assist in the safe evacuation of personnel when needed. As previously mentioned, CCAFS and KSC have a mutual aid agreement with each agency (45 SW and KSC, 2009), with Brevard County, and with local municipalities such as Titusville (KSC and City of Titusville, 2009). These agreements include providing assistance in the control and containment of hazardous material releases.

3.1.6.3 Site Restoration

The Installation Restoration Program (IRP) is the DoD's CERCLA-based environmental restoration program, which serves to identify, characterize, and remediate past environmental contamination on DoD installations. Within the USAF, AFI 32-7020 (*The Environmental Restoration Program*) provides guidance and procedures for executing the IRP at USAF installations. Because of prior soil contamination at SLC-41 (Solid Waste Management Unit 47), the FDEP approved land use controls for the complex in 2001 (CCAFS, 2001). There are no IRP sites at the VIF (CCAFS, 2009).

3.2 GLOBAL ENVIRONMENT

In addition to actions at CCAFS, this EA also considers the environmental effects on the global environment in accordance with the requirements of Executive Order 12114. Specifically, potential impacts on the global atmosphere and safety-related issues associated with space debris re-entry are discussed. This section describes the baseline conditions that may be affected by the Proposed Action.

3.2.1 GLOBAL ATMOSPHERE

3.2.1.1 Greenhouse Gases and Global Warming

Greenhouse gases (GHG) are components of the atmosphere that contribute to the greenhouse effect and global warming. GHGs may occur naturally in the atmosphere or result from human activities, such as the burning of fossil fuels. Federal agencies, states, and local communities address global warming by preparing GHG inventories and adopting policies that will result in a decrease of GHG emissions

produced by humans. According to the Kyoto Protocol, there are six GHGs: carbon dioxide (CO_2), nitrous oxide (N_2O), methane (CH_4), hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride (United Nations Framework Convention on Climate Change, 2007). Although some GHG (i.e., CO_2, CH_4, N_2O) occur naturally in the atmosphere, human activities have changed GHG atmospheric concentrations. From the pre-industrial era (i.e., ending about 1750) to 2004, concentrations of CO_2 have increased globally by 35 percent. Within the US, fuel combustion accounted for 94 percent of all CO_2 emissions released in 2005. On a global scale, fossil fuel combustion added approximately 30×10^9 tons (27×10^9 metric tons) of CO_2 to the atmosphere in 2004, of which the US accounted for about 22 percent (USEPA, 2007).

Since 1900, the Earth's average surface air temperature has increased by about 1.2° to 1.4° Fahrenheit (F) (0.7° to 0.8° Celsius [C]). The warmest global average temperatures on record have all occurred within the past 15 years, with the warmest 2 years being 1998 and 2005 (USEPA, 2010b). With this in mind, the USAF is supporting climate-change initiatives globally, while preserving military operations, sustainability, and readiness by working, where possible, to reduce GHG emissions.

3.2.1.2 Stratospheric Ozone Layer

The stratosphere, which extends from 32,800 ft (10,000 m) to approximately 164,000 ft (50,000 m) in altitude, contains the Earth's ozone layer (National Oceanic and Atmospheric Administration [NOAA], 2008). The ozone layer plays a vital role in absorbing harmful ultraviolet radiation from the sun. Over the last 20 years, ozone concentrations in the stratosphere have been threatened by anthropogenic (human-made) gases released into the atmosphere—primarily chlorine-related substances. Such materials include chlorofluorocarbons (CFCs), which have been widely used in electronics and refrigeration systems, and the lesser-used Halons, which are effective fire extinguishing agents. Once released, the CFCs and Halons are mixed worldwide by the motions of the atmosphere until they reach the stratosphere, where they are broken down by ultraviolet radiation. The freed chlorine and bromine atoms, from the respective CFC and Halon gas molecules, are then able to attack and repeatedly destroy ozone molecules.

Through global compliance with the 1987 Montreal Protocol on Substances that Deplete the Ozone Layer and amendments, the worldwide production of CFCs and other ozone-depleting substances has been drastically reduced and banned in many countries. A continuation of these compliance efforts is expected to allow for a slow recovery of the ozone layer (World Meteorological Organization [WMO], 2006).

3.2.2 RE-ENTRY DEBRIS

The Earth's gravity supplies the necessary centripetal force to maintain a fast moving satellite or other object in orbit. Over time, satellites can gradually lose kinetic energy due to friction with the upper reaches of the atmosphere. This loss of energy causes satellites to slowly lose altitude. Once the object enters the measurable atmosphere, atmospheric drag will slow it down rapidly and cause it to either completely or partially burn up during re-entry, and/or fall to Earth. Variations in characterizing orbiting objects (e.g., shape, composition, mass, velocity, altitude, orbital path) and the thickness and density of the atmosphere can make orbital decay and re-entry predictions difficult and inexact.

Satellites, upper stages from rockets, and other space debris have been re-entering the atmosphere ever since rockets and satellites have been launched into space. While re-entry debris reduces the hazard to other satellites and spacecraft still in orbit, it increases the potential for debris surviving re-entry to damage property or injure people on the ground. It has been estimated that 10 to 40 percent of a satellite's mass will survive re-entry. However, the risk that an individual will be hit and injured by a piece of re-entering debris is not significant considering that over the last 50 years, there have been over

5,000 reported satellite and rocket-body debris re-entries that were capable of causing injury to ground populations with no reported casualties (Aerospace Corporation, 2010).

In order to minimize the hazards of re-entry debris, US military space programs must comply with the National Space Policy of the United States of America (Office of the President, 2010), DoD Instruction (DoDI) 3100.12 (*Space Support*), and AFI 91-217 (*Space Safety and Mishap Prevention Program*), which implement policies and procedures for the safe conduct of missions in space. DoDI 3100.12 states that a spacecraft or upper stage may be disposed of by atmospheric re-entry, maneuvering to a storage orbit, or by direct retrieval. The risk of injury from the total debris casualty area for components and structural fragments surviving re-entry shall not exceed 1 in 10,000 based upon an evenly distributed human population density across the Earth, or it shall be confined to a broad ocean area or an essentially unpopulated area. AFI 91-217 contains similar space debris re-entry requirements.

AFI 91-217 also requires the preparation of Orbital Debris Assessment Reports and EOL Plans that include the results of the required analyses and documentation of non-compliances with the DoD and Air Force space debris mitigation requirements. If needed, waivers for any non-compliances will be approved by the appropriate approving official(s).

4.0 ENVIRONMENTAL CONSEQUENCES

This chapter presents the potential environmental consequences of the Proposed Action and No Action Alternative, described in Chapter 2.0 of this EA, when compared to the affected environment described in Chapter 3.0. The amount of detail presented in each section of the analysis is proportional to the potential for impact. The discussions address both *direct* and *indirect* impacts,[4] where applicable, in addition to any *cumulative* effects that might occur. Also included in the discussions, where necessary, are appropriate environmental monitoring and management actions and requirements, which are summarized in Section 4.3.

Chapter 6.0 lists the agencies, organizations, and personnel consulted as part of this analysis.

4.1 ENVIRONMENTAL CONSEQUENCES OF THE PROPOSED ACTION

The following sections describe the potential environmental consequences of implementing the Proposed Action. For each environmental resource or topical area, impacts are described that potentially could be affected by AEHF activities at CCAFS, at off-base locations, and within the global environment.

4.1.1 CAPE CANAVERAL AIR FORCE STATION AND VICINITY

Various management controls and engineering systems are in place at CCAFS and at KSC to manage and implement environmental and safety requirements. Required by Federal, state, DoD, USAF, and NASA specific regulations, these measures are implemented through normal operating procedures. To help ensure that procedures are followed, installation personnel and contractors receive periodic training on applicable environmental and safety requirements. In addition, environmental audits by both internal offices and external agencies are conducted to verify compliance.

4.1.1.1 Air Quality

The total direct and indirect air emissions associated with the Proposed Action were estimated and are shown in Table 4-1. Because the region has been designated an attainment area, there are no existing emission budgets. Due to the limited size and scope of the Proposed Action, it is not anticipated that the estimated emissions would make up 10 percent or more of regional emissions for any criteria pollutant or be regionally significant. Detailed air emissions calculations are provided in Appendix A.

The General Conformity Rules (40 CFR 93.153) require Federal agencies to determine whether their actions would increase emissions of criteria pollutants above preset threshold levels. These *de minimis* rates vary depending on the severity of the nonattainment and geographic location. Because CCAFS, KSC, and all other off-base areas associated with the Proposed Action are in attainment for all NAAQS, the General Conformity Rules do not apply. Based on the level of activities planned, the Proposed Action would be *de minimis*, fully conform to the State Implementation Plan, and not threaten the attainment status of the region.

Additionally, the Proposed Action would not introduce any new stationary sources of air emissions, thus no new emission permits or modifications to the CCAFS or KSC Title V permits would be required. The

[4] *Direct* impacts are caused by the action and occur at the same time and place. *Indirect* impacts occur later in time or are farther removed in distance, but are still reasonably foreseeable.

Table 4-1. Estimated Emissions of Criteria Pollutants for the Proposed Action at CCAFS and Off-base Locations [1]

Activity/Source	CO	NO_x	VOC	SO_x	PM_{10}	$PM_{2.5}$
Satellite Processing and Pre-Launch Preparation Emissions (tons per satellite mission)	0.97	0.22	0.13	<0.01	0.01	0.01
C-5 Aircraft Emissions (tons per landing and takeoff cycle) [2]	0.07	0.09	0.07	0.01	<0.01	<0.01
Total Emissions for One Satellite Mission (tons)	1.04	0.31	0.20	0.01	0.01	0.01
Total Annual Emissions for Two Satellites Missions (tons per year)	**2.08**	**0.62**	**0.40**	**0.02**	**0.02**	**0.02**
***De Minimis* Thresholds (tons per year)**	**100**	**100**	**100**	**100**	**100**	**100**
Exceeds *De Minimis* Threshold	**No**	**No**	**No**	**No**	**No**	**No**

Notes:
[1] Because the ASO SPF is a COCO facility, emissions associated with operations at the SPF are not included.
[2] Aircraft emissions are for elevations below 3,000 ft (914 m).

Proposed Action would be conducted in compliance with all applicable FDEP rules and regulations. All activities associated with the Proposed Action would be accomplished in full compliance with other (non-permitting) regulatory requirements through the use of compliant practices and/or products.

For the AEHF satellite processing and pre-launch preparation related emissions shown in Table 4-1, all of the sources listed below were estimated for direct and indirect emissions of criteria pollutants. Normal operation of facility boilers and the testing/maintenance of existing backup generators were not included since the emissions from such equipment are not specific to the AEHF satellite processing activities. Detailed methodologies for estimating the air emissions are provided in Appendix A. Emission levels presented in Appendix A are based on conservative estimations of the types of equipment used and the duration of the following activities:

- C-5 engine emissions during landing and takeoff cycles at the SLF
- Transport of the satellite, equipment, and materials between CCAFS, KSC, and the SPF in Titusville
- Worker commutes to and from CCAFS
- Use of solvents and adhesives

Based on the analysis presented above, no significant impacts to air quality would be expected during AEHF satellite processing and pre-launch preparations. The total direct and indirect emissions from AEHF satellite processing activities would be *de minimis* (of minimal importance), not be regionally significant, and not contribute to a violation of CCAFS's or KSC's air operating permits, or any air regulation.

4.1.1.2 Noise

Short-term negligible adverse effects on the noise environment would be expected from implementing the Proposed Action. Noise levels in the project area would not exceed ambient noise level standards as determined by the Federal, state, and/or local government. Minute increases in noise would result primarily from up to two C-5 air operations (landing and takeoff) per year at the SLF to deliver satellites, and from the ground transportation of satellites, equipment, and materials to and from facilities at

CCAFS, KSC, and the SPF in Titusville. These activities would be brief and negligible when compared to current activities, and would not appreciably change the noise environment. The limited number of additional aircraft operations would not affect AICUZ requirements for KSC. As a result, the proposed AEHF satellite processing and pre-launch preparations would not cause significant noise impacts.

4.1.1.3 Water Resources

During the handling and transport of liquid hypergolic propellant containers and the fueled AEHF satellites between CCAFS and the SPF in Titusville, the equipment and materials would be transported along SR 405, which is an elevated roadway that crosses both the Banana River and Indian River (see Figure 1-1). Numerous drainage ditches and canals also occur along the route, particularly on KSC. There are, however, no known potable surface or groundwater sources currently along the route.

Although an accident could result in the release of liquid propellants onto the ground or into local surface waters, numerous precautions are taken to prevent such an occurrence. For example, the fuel and oxidizer tanks must be transported in USDOT certified, stainless steel storage containers. Transport of the containers is accomplished at low speeds and with security convoy escorts.

Prior to transport of the AEHF satellite from the SPF to CCAFS, the onboard tanks would be loaded with both fuel and oxidizer. To prevent leakage, the stainless steel tanks must be constructed and pressure tested using high safety standards. Following satellite encapsulation, the encapsulated payload would be shipped from the SPF to CCAFS on a specialized transporter vehicle. Transport would occur at low speeds and with security convoy escorts.

If a leak or accidental spill were to occur anywhere along the transportation routes or at a facility, personnel on site would immediately contact the proper authorities for an emergency or HAZMAT response. On CCAFS and on KSC, the appropriate HAZMAT teams or other emergency personnel would respond to implement appropriate procedures to isolate and contain any propellant releases in accordance with the 45 SW and NASA plans and procedures described in Section 3.1.5.2. Either NASA or 45 SW teams would respond to any incidents occurring along the NASA Parkway over the Banana River. If an incident were to occur in Titusville or on the NASA Causeway over the Indian River, the Titusville Fire Department would likely be contacted first. Depending on the type of incident and location, the Brevard County Fire Department Specialized Response Team and/or the KSC HAZMAT team would also be contacted to respond.

The HAZMAT teams within each affected jurisdiction (Brevard County, KSC, and CCAFS) are trained and equipped to handle hazardous material incidents, such as those involving liquid propellants. This includes spill-on-water incidents, which require rapid containment and control of spills. If more extensive cleanup requirements are needed, the FDEP Bureau of Emergency Response would be contacted.

Because of the low risk for a liquid propellant spill or leakage to occur, no significant impacts to surface or groundwaters are expected to occur as a result of the Proposed Action. If a hazardous material incident were to occur, appropriate resources are available to respond to an emergency.

4.1.1.4 Biological Resources

There would be no disturbance of vegetated habitats in support of the Proposed Action. Each AEHF satellite container offloaded at the KSC SLF, as well as any trucks entering CCAFS in support of AEHF, would be inspected for invasive flora and fauna. Trucks and other transport vehicles used for the project would remain on roads and other paved areas; no off-road travel is planned. Because satellite processing and pre-launch operations would occur at the existing VIF and LC-41, AEHF activities at these facilities

would have no adverse impacts on vegetation or wildlife, including "no effect" on the following listed species: Florida scrub-jay, southeastern beach mouse, indigo snake, American alligator, and gopher tortoise.

For any operations conducted at night during the sea turtle nesting season (April 1 through October 31), all facilities would comply with existing Light Management Plans in accordance with 45 SWI 32-7001. Thus, AEHF processing and pre-launch operations would have "no effect" on threatened and endangered sea turtle species occurring along the station beaches.

In support of the AEHF operations, the 45 SW Environmental Management Office would continue to manage vegetation and wildlife in accordance with the station's Integrated Natural Resources Management Plan (USAF, 2006a) and applicable management plans for individual species. As a result, the proposed processing and pre-launch activities would have no significant impact on biological resources.

4.1.1.5 Safety and Occupational Health

During air transport to KSC, the AEHF satellite would contain various hazardous materials—including batteries, anhydrous ammonia in heat pipes, and various small electro-explosive devices—but it would not contain any propellants. Because of the potential risks of hazardous chemical releases, transportation and handling requirements for the satellite would be accomplished in accordance with DoD, USAF, and USDOT policies and regulations to safeguard the satellite from fire or other mishap. Mishaps during air transport of satellites to KSC are unlikely, since USAF flight crews are constantly trained in the operation and safety of the aircraft. Satellites are routinely transported to CCAFS and KSC via C-5, C-17, and other large aircraft.

After arrival at KSC, ground transport accidents involving the satellites or liquid propellant containers are also unlikely because of the low speeds maintained by transport trucks and the accompanying security convoy escorts. Special handling requirements for the shipment of liquid propellants include following certified and approved routes, extensive driver qualifications, and various state notification requirements. As described in Section 2.1.2.1, the USAF developed a transportation plan specific to the AEHF program, which identifies satellite shipping and handling procedures, safety requirements, and any necessary permits.

The proposed AEHF satellite processing and pre-launch activities represent routine types of activities at all locations involved. All applicable Federal, state, and local health and safety requirements, such as OSHA regulations within 29 CFR, would be followed, as well as all applicable DoD, USAF, and NASA regulations. The handling of satellites and propellants are hazardous operations that require special care and training of personnel. Program personnel must follow safety procedures and wear appropriate Personal Protective Equipment during the handling and transfer of materials. By adhering to the established and proven safety standards and procedures identified in Section 3.1.5 of this EA, the level of risk to Government and military personnel, contractors, and the general public would be minimal.

Based on the safety precautions that would be in place prior to project implementation, no significant impacts to safety and occupational health are expected.

4.1.1.6 Hazardous Materials and Waste Management

The proposed AEHF satellite processing and pre-launch activities represent routine types of activities. As identified in Section 2.1.2, various hazardous materials would be used in support of the satellite processing and pre-launch activities, which would include liquid hypergolic propellants, and small

amounts of adhesives, sealants, paints, and solvents. The Xenon gas—for the satellite's electrical propulsion system—is a naturally occurring, inert gas that is non-toxic and non-flammable. All of the hazardous materials would be managed appropriately through either the CCAFS HazMart or the Joint Propellants Contractor. Management policies for hazardous materials used and stored on the station include material compatibility, security, leak detection and monitoring, spill control, personnel training, and specific spill-prevention mechanisms. Whenever possible, AEHF operations on the station would use environmentally-preferred and/or recyclable materials.

All hazardous wastes generated on CCAFS by AEHF operations would be handled in accordance with 45 SW OPLAN 19-14, which addresses the proper identification, management, and disposition of hazardous wastes. The disposition of hazardous wastes is typically handled by the 45 SW's ESC. The ESC is responsible for ensuring that hazardous waste disposal services comply with all applicable regulations governing the handling, transportation, storage, treatment, and disposal/reclamation of the waste, including excess or contaminated propellants and propellant-related wastes. All hazardous wastes would be properly containerized, labeled, and placed at approved holding sites in accordance with all applicable Federal, state, and local regulations. Because all hazardous material and associated wastes for AEHF operations on CCAFS would be responsibly managed in accordance with the well-established policies and procedures identified in Section 3.1.6, hazardous material and waste-handling capacities at CCAFS would not be exceeded and management programs would not have to change.

Although the risk is low, there is a potential for liquid propellant spills or mishaps to occur during the handling and transport of propellant containers between CCAFS and the SPF in Titusville, as well as the fueled AEHF satellites from the SPF in Titusville to the VIF on CCAFS. If an incident were to occur, the appropriate HAZMAT teams or other emergency personnel would immediately be contacted to implement appropriate procedures to isolate and contain any propellant releases. As described in Section 4.1.1.3, appropriate emergency response resources are available within each affected jurisdiction (Brevard County, KSC, and CCAFS) to isolate, contain, and cleanup a spill. If more extensive cleanup requirements are needed, the FDEP Bureau of Emergency Response would be contacted.

As a result, no significant impacts from the management of AEHF-related hazardous materials and waste are expected.

4.1.2 GLOBAL ENVIRONMENT

4.1.2.1 Global Atmosphere

The Proposed Action would not induce a long-term significant addition to GHG in the atmosphere. Under the Proposed Action, all combined AEHF activities, including the C-5 air transport and all operations at CCAFS and KSC, would generate approximately 2,139 tons (1,940 metric tons) of CO_2 per year for two AEHF satellite missions. This is equivalent to annual GHG emissions from 370 passenger vehicles, or the consumption of 4,510 barrels of oil (USEPA, 2010c). Detailed emission calculations of CO_2 from the Proposed Action are provided in Appendix A. The amount of CO_2 released by the Proposed Action is expected to be less than 0.0001 percent of the anthropogenic emissions for this gas released on a global scale annually (USEPA, 2007). In addition, the CEQ recently released draft guidance on when and how Federal agencies should consider GHG emissions and climate change in NEPA analyses. The draft guidance includes a presumptive effects threshold of 27,563 tons (25,000 metric tons) of CO_2 equivalent emissions from a proposed action on an annual basis (CEQ, 2010). The GHG emissions associated with the Proposed Action fall well below the CEQ threshold. Although this limited amount of emissions would not contribute significantly to global warming, any emission of GHG represents a minute increase that could have incremental effects on the global atmosphere.

Notably, there would be little or no CFCs or other ozone depleting substances used or released during AEHF-related processing activities and pre-launch preparations at CCAFS and KSC. Therefore, these activities would have no effect on the stratosphere ozone layer.

4.1.2.2 Re-entry Debris

Re-entry debris from satellites and rocket stages presents an extremely low risk to humans. In general, sub-millimeter size objects settle slowly through the stratosphere. Intermediate size objects (millimeter to decimeter) may melt/vaporize in or above the stratosphere. However, larger objects (decimeters and larger) may survive to the Earth's surface. Atmospheric drag will eventually pull these objects to Earth. The quantity of debris surviving re-entry depends on the materials used in the spacecraft's or rocket engine's construction, and on size, shape, and weight of the re-entering object. For example, if the object is made of stainless steel or titanium (both with high melting temperatures), such as fuel tanks or structural members, much of this material can survive atmospheric re-entry. In contrast, objects made of aluminum (with a relatively low melting temperature) tend not to survive re-entry. (Aerospace Corporation, 2010).

4.1.2.2.1 Atlas V Centaur Upper Stage

After each AEHF satellite is safely released into its GEO transfer orbit, the remaining propellant in the Centaur upper stage would be blown down to optimally reduce risks of on-orbit explosion, while also reducing risks of collision with existing satellite systems. The Centaur upper stages would then be left in disposal orbits that would result in uncontrolled atmospheric re-entries that are not in compliance with DoDI 3100.12 and AFI 91-217.

Because the first AEHF mission has been designed to use nearly all of the Centaur's propellants to insert the satellite into orbit, there would be insufficient residual propellant left after spacecraft separation to significantly modify the perigee of the Centaur's disposal orbit. Accordingly the USAF has obtained a waiver of these requirements prior to launch from the appropriate approving official(s). As a mitigation alternative for later AEHF missions, the USAF is planning to modify the post-mission disposal strategy for the Centaur upper stage by lowering the disposal orbit perigee altitude as much as possible, while assuring with high confidence that re-entry would not occur during the first orbital revolution. This would decrease the mean expected orbital lifetime and should also result in a lower mean (over orbital lifetime variation) re-entry casualty expectation, assuming that the ground population would continue to increase at a constant level over the range of orbital lifetime variation.

4.1.2.2.2 AEHF Satellite

Once each AEHF satellite is launched into a GEO orbit, the satellite is not expected to generate any space debris that could re-enter the Earth's atmosphere. In addition, the USAF would conduct on-orbit collision avoidance maneuvers throughout the operational life of each satellite to minimize the probability of collision with other space objects. Because each AEHF satellite would be placed in a higher GEO orbit for EOL disposal, the satellites are not expected to re-enter the Earth's atmosphere for hundreds if not thousands of years.

At the completion of each AEHF satellite's 14-year design life, USAF personnel on the ground would implement EOL disposal plans for the vehicle. Once in disposal orbit, EOL measures identified in Section 2.1.3 would be implemented to prevent the satellite from generating space debris that could re-enter the Earth's atmosphere or collide with another object. In compliance with DoDI 3100.12, the AEHF satellites would deplete or safe all on-board sources of stored energy, including: blow down of residual fuels to the extent possible, safing pressurized systems, disabling battery charging systems,

discharging batteries, and disabling transmitters. Similar EOL measures have been applied to other USAF satellite programs operating in GEO orbit. If, however, an anomaly or collision with another space object were to occur, it is possible that some or all of the AEHF satellite components would re-enter the atmosphere much sooner. Although the satellite debris could potentially survive re-entry to the Earth's surface, such a scenario is highly unlikely.

As previously mentioned, there have been no reported casualties over the past 50 years of space launches even though there have been over 5,000 reported re-entries of satellites and rocket-body debris objects that could have potentially injured a person on the ground (Aerospace Corporation, 2010). Thus, the AEHF missions, including use of the Atlas V Centaur upper stages, would present a negligible risk to populations on the ground. No significant impacts from re-entry debris are expected to occur.

4.2 ENVIRONMENTAL CONSEQUENCES OF THE NO ACTION ALTERNATIVE

Under the No Action Alternative, the USAF would not go forward with the AEHF satellite beddown and deployment program. As a result, potential impacts from proposed satellite processing, pre-launch preparations, launch, operations, and disposal would not occur. CCAFS and KSC would continue ongoing operations, with environmental conditions expected to remain unchanged from that described for the Affected Environment in Chapter 3.0 of this EA.

4.3 CUMULATIVE EFFECTS

Cumulative effects are considered to be those resulting from the incremental effects of an action when considering past, present, and reasonably foreseeable future actions, regardless of the agencies or parties involved. In other words, cumulative effects can result from individually minor, but collectively potentially significant, impacts occurring over the duration of the Proposed Action and within the same ROI.

4.3.1 CAPE CANAVERAL AIR FORCE STATION AND VICINITY

The proposed AEHF processing and pre-launch preparations would be conducted in a manner similar to that of other satellite programs at CCAFS. During program implementation, only one or two satellites would be processed and launched in any one year. These actions would represent an 11 to 29 percent increase in the total annual satellite launch activity for CCAFS, based on satellite launch forecasts for the station.[5]

Air Quality

Negligible temporary increases in air emissions would occur, primarily from AEHF satellite, equipment, and material transport and pre-launch activities. Additionally, other projects and activities would occur at CCAFS, KSC, and within the region, resulting in increased amounts of air pollutants. These events would include aircraft operations, use of ground equipment, and processing activities for other satellite programs. The State of Florida takes into account the effects of all past, present, and reasonably foreseeable activities during the development of their State Implementation Plan (as required by the CAA). The Proposed Action would conform completely to the plan. Therefore, implementation of the Proposed Action would not result in significant cumulative air quality impacts.

[5] At CCAFS, seven satellite launches are forecast in FY 2010, while nine are forecast in FY 2011 (Edwards, 2009). For the period between FY 2012 and FY 2020, similar satellite launch rates are expected.

Noise

Noise associated with the Proposed Action would primarily come from minute changes in aircraft operations and local vehicle traffic. The addition of two air operations per year at the SLF would only increase the number of annual operations by less than 0.1 percent. All activities associated with the Proposed Action would be temporary in nature and end with completion of each AEHF mission. Other projects and activities at CCAFS and KSC typically generate noise at different locations and at different times; thereby, limiting the potential for cumulative effects. Therefore, the Proposed Action would not appreciably contribute to cumulative noise effects.

Water Resources

Because of the minimal risk for a fuel or other hazardous material spill or leakage to occur during each AEHF mission, no significant cumulative impacts to surface or groundwaters are expected to occur as a result of the Proposed Action. If a hazardous material incident were to occur, appropriate emergency response resources are available within each affected jurisdiction (Brevard County, KSC, and CCAFS) to isolate, contain, and cleanup a spill.

Biological Resources

AEHF activities on CCAFS would occur at different locations, often at different times, and generally for short periods. Because of the limited area that would be affected, no cumulative adverse effects on vegetation and wildlife, including listed species, are expected to occur.

Safety and Occupational Health

At both CCAFS and KSC, all projects must comply with applicable standards, policies, and procedures for safety and occupational health. All satellite missions are closely reviewed and analyzed to ensure that there are no unacceptable risks to the public, Government and military personnel, and contractors. Because implementation of the AEHF satellite program would also comply with these same requirements, no significant cumulative impacts to safety and occupational health are expected to occur.

Hazardous Materials and Waste

Implementing the AEHF program at CCAFS would not introduce new types of hazardous materials and wastes, and only a small increase in quantities is expected. As stated in Section 4.1.1.5, CCAFS has in place policies and procedures to manage the storage, handling, and disposal of hazardous materials and wastes in accordance with Federal, state, and local regulations. Therefore, no significant cumulative impacts from the management of hazardous materials and waste are expected.

4.3.2 GLOBAL ENVIRONMENT

Global Atmosphere

On a global basis, the Proposed Action would release a minute quantity of CO_2 (up to 2,139 tons [1,940 metric tons] per year) compared to anthropogenic releases worldwide and the CEQ's draft threshold guidance. This limited amount of emissions would not contribute significantly to cumulative global warming; however, any emissions of GHG represent an incremental increase that could have incremental effects on the global atmosphere.

Because the AEHF missions would release little or no ozone depleting substances, there would be no cumulative impacts on the stratospheric ozone layer.

Re-entry Debris

The plan for up to six AEHF missions would result in up to six Atlas V Centaur upper stage rocket motors in orbit. Because the missions would be launched over a period of 11 years, re-entry of individual Centaur motors is expected to occur over multiple years. As necessary for each mission, the USAF will obtain a waiver prior to launch from the appropriate approving official(s) for any non-compliances with DoDI 3100.12 and AFI 91-217.

Because each AEHF satellite would be placed in a higher GEO orbit following EOL disposal, they are not expected to re-enter the Earth's atmosphere for hundreds if not thousands of years. Additionally, the EOL measures to be implemented would prevent the satellites from generating space debris that could re-enter the Earth's atmosphere.

As previously mentioned, the risk that an individual will be hit and injured by a piece of re-entering debris is extremely low, considering that there have been no reported casualties from re-entered space debris over the past 50 years of space launches. Consequently, no significant cumulative impacts to the global environment from re-entry debris are anticipated.

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APPENDIX A

AIR EMISSIONS CALCULATIONS

Table A-1. Roll-up of All Direct and Indirect Emissions Associated with the Proposed Action

	CO	NO_x	VOC	SO_x	PM_{10}	$PM_{2.5}$	CO_2
Processing Emissions (tons per satellite)	0.97	0.22	0.13	<0.00	0.01	0.01	103.8
C-5 Emissions (tons per satellite)	0.07	0.09	0.07	0.01	<0.00	<0.00	965.8
Total Emissions (tons per satellite)	1.04	0.31	0.20	0.01	0.01	0.01	1069.6
Total Annual Emissions for two satellites (tons per year)	2.08	0.62	0.40	0.02	0.02	0.02	2139.2

Table A-2. Delivery of Equipment and Materials During AEHF Satellite Processing (Single Satellite)

Number of Deliveries	2
Number of Trips	2
Miles Per Trip	30
Days of Support	90
Total Miles	10800

Pollutant	CO	NO_x	VOC	SO_x	PM_{10}	$PM_{2.5}$	CO_2
Emission Factor (lbs/mile)	0.0219	0.0237	0.0030	0.0000	0.0009	0.0007	2.7
Total Emissions (lbs)	237.05	256.10	32.32	0.28	9.25	7.98	29369.9
Total Emissions (tons)	0.1185	0.1280	0.0162	0.0001	0.0046	0.0040	14.7

Source: CARB, 2009.

Table A-3. Ground Transport of AEHF Satellite (Single Satellite)

Total Miles	70

Pollutant	CO	NO_x	VOC	SO_x	PM_{10}	$PM_{2.5}$	CO_2
Emission Factor (lbs/mile)	0.0219	0.0237	0.0030	0.0000	0.0009	0.0007	2.7
Total Emissions (lbs)	1.54	1.66	0.21	0.00	0.06	0.05	190.4
Total Emissions (tons)	0.0008	0.0008	0.0001	0.0000	0.0000	0.0000	0.1

Source: CARB, 2009.

Table A-4. Worker Commutes during AEHF Satellite Processing (Single Satellite)

Number of Workers	30
Number of Trips	2
Miles Per Trip	30
Days of Support	90
Total Miles	162000

Pollutant	CO	NO_x	VOC	SO_x	PM_{10}	$PM_{2.5}$	CO_2
Emission Factor (lbs/mile)	0.0105	0.0011	0.0011	0.0000	0.0001	0.0001	1.1
Total Emissions (lbs)	1708.85	178.67	174.83	1.74	13.78	8.57	178,124.2
Total Emissions (tons)	0.8544	0.0893	0.0874	0.0009	0.0069	0.0043	89.1

Source: CARB, 2009.

Table A-5. Total AEHF Satellite Processing Emissions (tons) (Single Satellite)

Activity/Source	CO	NO_x	VOC	SO_x	PM_{10}	$PM_{2.5}$	CO_2
Delivery of Equipment and Supplies	0.1185	0.1280	0.0162	0.0001	0.0046	0.0040	14.7
Ground Transport of AEHF Satellite	0.0008	0.0008	0.0001	0.0000	0.0000	0.0000	0.1
Worker Commutes	0.8544	0.0893	0.0874	0.0009	0.0069	0.0043	89.1
Total AEHF Satellite Processing Emissions (tons per satellite)	0.97	0.22	0.10	0.00	0.01	0.01	103.8

Table A-6. Aircraft Landing and Takeoff (LTO) Emissions (Criteria Pollutants) (Single Satellite)

Number of LTO per Year	1					
	CO	NO_x	VOC	SO_x	PM_{10}	$PM_{2.5}$
LTO Emission Factors (kg/operation)	67.658	77.335	61.767	5.03	1.065	1.1
LTO Emission (tons)	0.0744	0.0851	0.0679	0.0055	0.0012	0.0012
Total C-5 Emissions (tons per year)	0.07	0.09	0.07	0.01	<0.01	0.0012

Source: FAA, 2007.

Table A-7. Aircraft Total Flight Emissions (Carbon Dioxide) (Single Satellite)

Fuel Use (Single C-5 Flight)			
Mode	Time [s]	Fuel Flow [kg/s]	Fuel Used [kg]
Takeoff	42	1.812	76.1
Climb-Out	132	1.502	198.3
Approach	240	0.494	118.6
Idle	1560	0.176	274.6
	Miles	Fuel Flow [kg/mile]	Fuel Used [kg]
Cruise	3,966.7	35.6	141,214.5
		Total Fuel Used	68,820.2

Molecular Weight Jet A ($C_{12}H_{26}$)	170.8	kg/kmol
Molecular Weight $12CO_2$	528.6	kg/kmol
Molar Ratio	3.1	kg CO_2/ kg Jet A
Total Jet A Fuel Used	141,882.0	kg per flight
Total CO_2 per flight	439,000.4	kg per flight
Total CO_2 per flight	482.9	tons per flight
Number of Flights Per Year	2.0	flights
Annual CO_2 From C-5 Flights	965.8	tons per year

Sources: Frawley, 2002; Lockheed Martin, 2010; and USAF, 2009

References

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Lockheed Martin. 2010. C-5 *Galaxy specifications.* URL: http://www.lockheedmartin.com/products/c5/c-5-specifications.html, accessed May 14, 2010.

US Air Force (USAF). 2009. *US Air Force Fact Sheet C-5 Galax*

APPENDIX B

COMMENTS AND RESPONSES ON THE DRAFT ENVIRONMENTAL ASSESSMENT

From: Milligan, Lauren [mailto:Lauren.Milligan@dep.state.fl.us]
Sent: Wednesday, June 16, 2010 4:13 PM
To: Adel.Hashad@losangeles.af.mil; Showers, Jenise
Cc: Kriz, Joe; Marriott, Jacqueline
Subject: RE: Draft Environmental Assessment (EA) for the Air Force AEHF Program

Mr. Adel Hashad
U.S. Air Force, SMC/EAF
483 North Aviation Blvd.
El Segundo, CA 90245-2808

RE: Department of the Air Force – Draft Environmental Assessment for the Advanced Extremely High Frequency (AEHF) Satellite Beddown and Deployment Program, Cape Canaveral Air Force Station – Brevard County, Florida.
SAI # FL201006165288C

Dear Mr. Hashad:

Florida State Clearinghouse staff has reviewed the subject Draft Environmental Assessment (EA) under the following authorities: Presidential Executive Order 12372; Section 403.061(40), *Florida Statutes*; the Coastal Zone Management Act, 16 U.S.C. §§ 1451-1464, as amended; and the National Environmental Policy Act, 42 U.S.C. §§ 4321-4347, as amended.

Based on the information contained in the Draft EA and minimal project impacts, state has determined that the proposed federal action is consistent with the Florida Coastal Management Program.

If you have any questions regarding this message or the state intergovernmental review process, please don't hesitate to contact me at (850) 245-2170 or Lauren.Milligan@dep.state.fl.us. Thank you.

Yours sincerely,

Lauren P. Milligan

Lauren P. Milligan, Environmental Manager
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From: Phillips, Lynne V. (KSC-TAB1C) [mailto:lynne.v.phillips@nasa.gov]
Sent: Friday, June 25, 2010 6:31 AM
To: Adel.Hashad@losangeles.af.mil; Kriz, Joe
Cc: Shaffer, John P. (KSC-TAB1C)
Subject: EA for AEHF - NASA Comments

Mr. Adel and Mr. Kriz,

The Kennedy Space Center, Environmental Management Branch received the Draft Environmental Assessment (EA) and Finding of No Significant Impact (FONSI) for the Advanced Extremely High Frequency (AEHF) Satellite Beddown and Deployment Program on June 14, 2010. We have distributed copies of the EA internally for review and comment by the appropriate KSC directorates. Based on the information provided NASA/KSC has no comments on the EA and FONSI.

Please feel free to call or email if you require further clarification on this response.

Lynne Phillips
Physical Scientist, NASA
KSC Enviromental Management Branch

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From: Todd_Mecklenborg@fws.gov [mailto:Todd_Mecklenborg@fws.gov]
Sent: Friday, June 25, 2010 2:05 PM
To: Marriott, Jacqueline; Adel.Hashed@losangeles.af.mil
Cc: 'Ann_Marie_Lauritsen@fws.gov'; Showers, Jenise
Subject: Re: FW: Draft Environmental Assessment (EA) for the Air Force AEHF Program

The Service has reviewed the above noted Environmental Assessment. The Service concurs with your no effect determination for the Florida scrub-jay, southeastern beach mouse, and eastern indigo snake. In addition, if night operations occur, the document commits to adhere to the Light Management Plan (45 SWI 32-7001) for sea turtles. With implementation of these precautionary measures, the Service also concurs with a no effect determination for sea turtles.

Todd Mecklenborg, Fish & Wildlife Biologist
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